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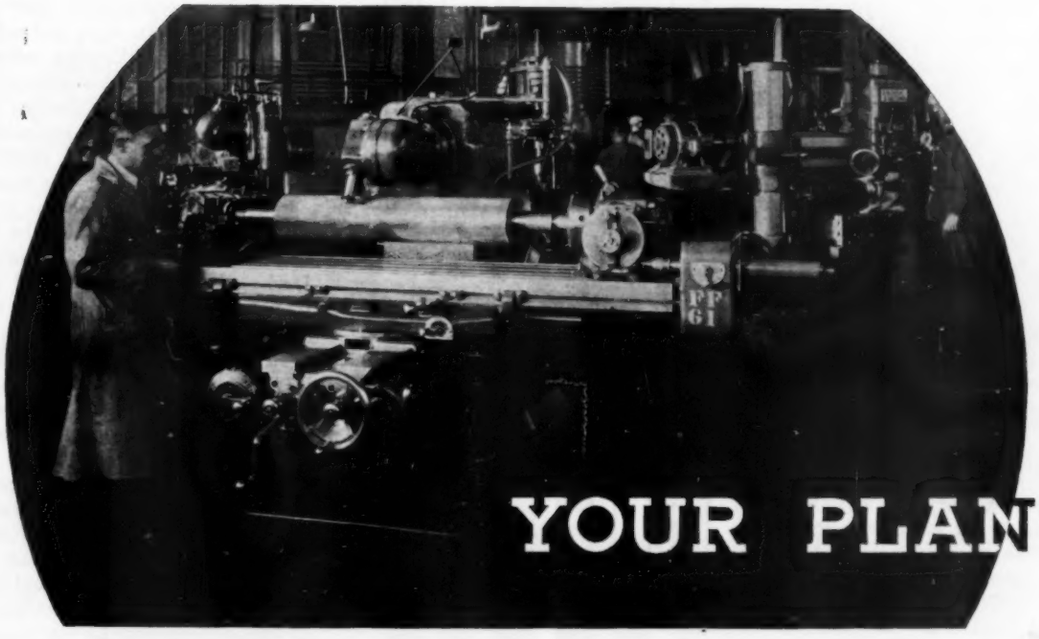


YOUR PLANT WHERE DOES IT STAND?

A survey made at Farrel-Birmingham answered this question as regards its own manufacturing facilities and formed the basis of a definite policy on new equipment

JOHN HAYDOCK
Managing Editor

N. W. PICKERING read *American Machinist's* Inventory of Metal-Working Equipment. "Sixty-five per cent over ten years old—I wonder how we stack up."

That was some ten months ago. As president of the Farrel-Birmingham Company, Mr. Pickering has a keen interest in equipment; only through its effective use can the manufacturing activities for which he is responsible be operated to best advantage. He knew at the time that some new machine tools were needed; he knew also that his concern, like most others, had deferred the purchase of equipment during the depression years.

But just how did his company compare with the averages given in the inventory? And just what new machines would be needed to initiate a well balanced modernization program? Mr. Pickering resolved to find the answers to these questions for his own information and for the purpose of presenting a specific replacement program to the Farrel-Birmingham executive committee.

Accordingly, he asked Albert S. Redway, acting manager of the Machine Division, to make a survey of the departments under his supervision. The result was a complete report, which showed the status of all equipment in these departments. So graphic a picture was drawn of the plant's physical condition that the three-year replacement program included in the report was approved in general and an appropriation granted for immediate purchase of the tools requested for

1936. Favorable action on Mr. Redway's recommendations led to similar surveys in the Roll Division and in the Buffalo Plant, with the result that a company-wide modernization plan has been adopted.

The survey of the Machine Division covered Farrel-Birmingham's equipment for making a miscellaneous line of products, which include Banbury mixers, rubber machinery, sugar mills, roll grinders and rolling mills. This activity was at one time divided between the Ansonia and Derby plants, but during the years of diminished business, production was concentrated at Ansonia and some of the Derby plant equipment was moved there.

The report on these facilities shows the following:

1. The total usable tools in place, including plan layouts of the plant with each machine cut out to scale and placed in its proper location. One of these plans is reproduced here.

2. The percentage of machines written off, those over ten years old, and the percentage that will pass the ten-year mark each year until 1938. These figures are broken down into four classes of machines as will be explained later.

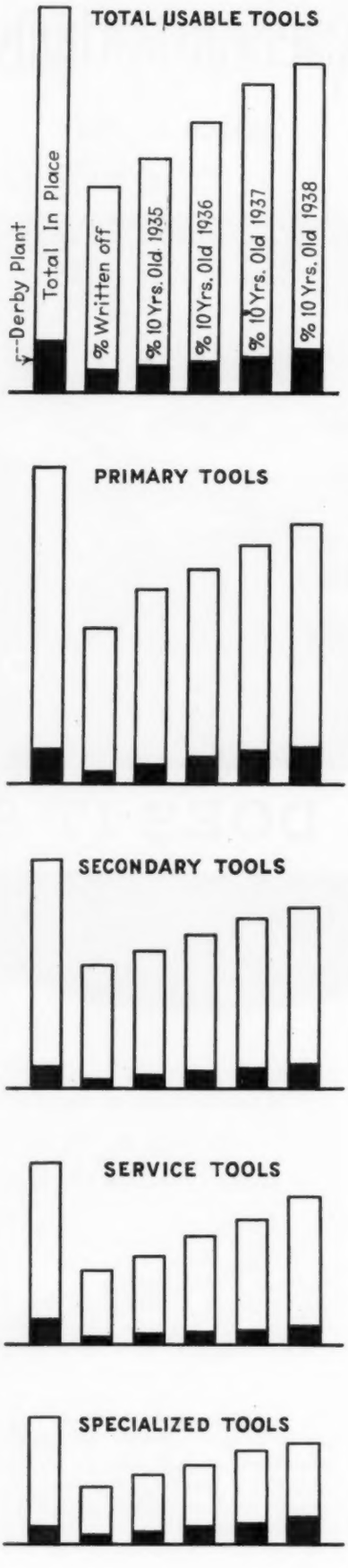
3. Total machine investment, book value and amount depreciated in the Ansonia and Derby plants. These figures are also divided into four main groups and into subgroups giving specific types of machine tools.

4. A summary of changes in the machine tool equipment at Ansonia and Derby during 1932-1935. This section covers all interplant transfers, sales of old equipment, scrapping of old equipment and new tools purchased. For each item is given installation date and cost, book value, and actual or estimated salvage or resale value.

5. A list of useless tools in both plants recommended to be sold or scrapped with values given as above.

6. Dollar value of annual plant equipment purchases since 1925 and the amount of depreciation charged off in the corresponding years.

From the comprehensive scope of this report it must not be inferred that the Farrel-Birmingham Company found itself handicaped by an excessive amount of obsolete equipment. It did find, however, that taking stock of its physical equipment proved a valuable guide in handling the increased demand for its products.



For example from (6) above it was shown that during the decade from 1925 to 1934 inclusive over 85 per cent of the total depreciation was spent in keeping equipment up to date.

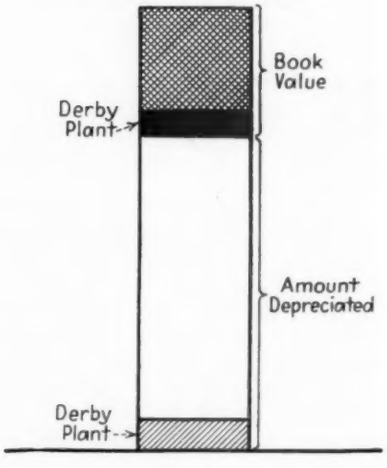
In fact from 1925 to 1931, expenditures for new plant equipment actually exceeded charge-offs by some 15 per cent, showing that this concern regarded its depreciation reserve as a fund to be put to work instead of being merely a bookkeeping entry, as is too often the case. A similar survey in many concerns would disclose far less attention to equipment replacement.

It is true that during 1932-3-4 the outlay for reequipment was small compared with the depreciation for those three years. But it should be remembered that during this period the Derby plant was stripped of its best tools to serve the departments actually at work.

In compiling his report, Mr. Redway was not content to confine himself to past records of plant equipment; in addition he asked each foreman to report on every machine in his department on the form shown on page 224. The space above the double rule was filled from company records and that below by the foreman. Thus a complete history was summarized for each machine, together with the opinion of the man responsible for its efficient use.

For the final recommendations, these reports were gone over with the plant superintendent, and each machine was passed upon with a conservative appraisal of immediate needs.

Bar charts give graphically the total tools in place in both the Ansonia and Derby plants, the percentage written off and the growing volume of old equipment were a replacement policy not inaugurated. Similar charts were made for planers, lathes and other specific types of machine tools



Consideration was taken of the fact that the type of product the company is manufacturing today differs materially from that made ten or fifteen years ago and that it is impossible to foresee what will be manufactured ten years from now.

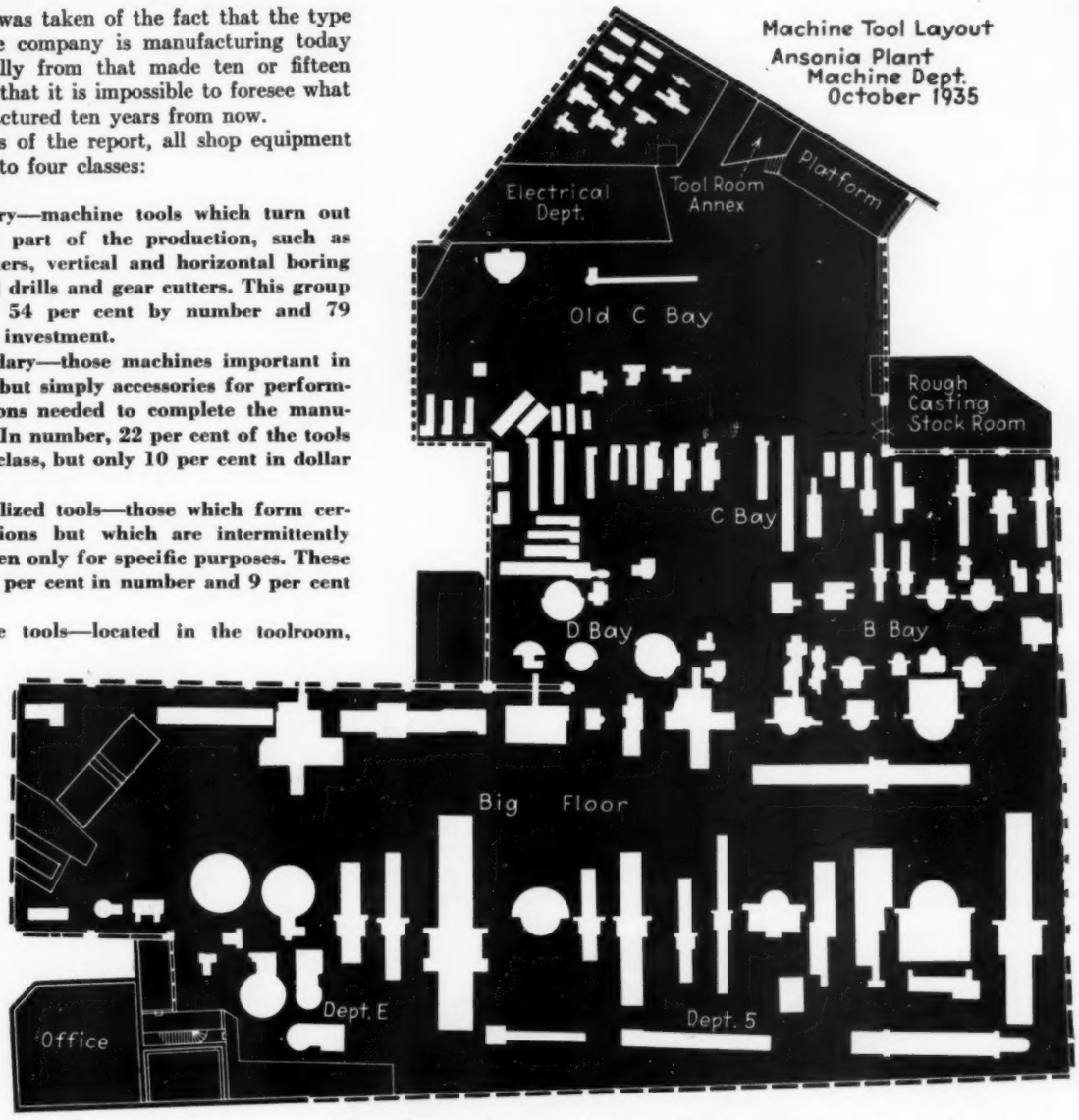
For purposes of the report, all shop equipment was divided into four classes:

1. Primary—machine tools which turn out the greater part of the production, such as lathes, planers, vertical and horizontal boring mills, radial drills and gear cutters. This group contributed 54 per cent by number and 79 per cent in investment.

2. Secondary—those machines important in production but simply accessories for performing operations needed to complete the manufacturing. In number, 22 per cent of the tools fell in this class, but only 10 per cent in dollar value.

3. Specialized tools—those which form certain operations but which are intermittently used and then only for specific purposes. These represent 8 per cent in number and 9 per cent in value.

4. Service tools—located in the toolroom, erecting shop, etc., for maintenance or tool work and non-productive operations except for making small alterations on production pieces. Service tools represent 16 per cent in number and 2 per cent in dollar value.



A floor plan, machines in place to scale size, and those completely written off in a distinctive color, gives at a glance possibilities for replacement

The report takes up these four groups in turn and, under each of them, specific types of machine tools; in every instance the percentage over ten years old and the new developments in each type that affect desirability of replacement are given. Such factors as accuracy, reduction in manufacturing cost, ease of manipulation, possibility of use with tungsten carbide, and repair costs are carefully weighed. Down through the list each type is discussed, giving local considerations that affect operation.

In addition to drawing a complete picture of his division's status, Mr. Redway, in his report, makes a comparison with the condition of equipment in industry as a whole.

"In the early part of 1935," he states, "the magazine *American Machinist* sent out questionnaires to all industries in the metal-cutting field to determine how much of their equipment was ten years old or more and asked that this equipment be classified according to various machine tools.

"Accompanying this report is a copy of their tabulated return which you will see covers over 1,300,000 machine tools. Opposite each class of production equipment comparable to the equipment we have in operation I have placed the percentage of our tools over ten years old, leaving out of consideration the obsolete or useless tools which we are holding in Derby for resale or scrap."

Later the report covers trends in machine tool construction with the following paragraphs.

"There is one thing which must be borne in mind, and that is, that new tools purchased today cost a great deal more than they did a few years ago, not necessarily because of increased production costs but because the tool builders are making their machines more complete and are including many features that speed up the operation of the machine tremendously and, of course, cost money.

"We, therefore, can expect to spend more money in the future to replace

tools without considering adding to our production facilities to any extent. However, with modern tools we can certainly turn out more work per hour than with the older type of tool, thus saving floor space and reducing our direct labor cost.

"Also, the modern tools are built so that they will not have the high maintenance charges that have been necessary on the older type of tool. Practically all modern tools are equipped with hardened parts, anti-friction bearings, and complete or semi-complete automatic lubrication."

When this report was submitted three new machine tools were already on order but had not been installed. They consisted of one Higley cut-off saw and two Libby turret lathes. The 1936 part of the three-year program, which is now officially approved, has already been acted upon. It covers the acquisition of the following equipment for Ansonia Machine Division, Roll Department and the Buffalo Plant:

1 Niles heavy duty lathe	**1 American lathe**
1 Ingersoll horizontal boring machine	**1 Milwaukee universal miller**
1 Gray openside milling planer	**1 Cincinnati-Bickford radial**
5 Libby turret lathes	**1 P. & W. vertical shaper**
1 Warner & Swasey turret lathe	**1 Gardner vertical grinder**
2 Hendey manufacturing lathes	**1 Sellers drill grinder**
1 Hendey 12-speed lathe	**1 Higley cut-off saw**
	1 Racine cut-off saw

From the scope of this report it may be seen that considerable time and thought went into its preparation, partly due to the fact that it was the first one to be compiled and had to be started from scratch. Purchases for 1936 have been completed.

Each year the report will be reviewed, brought up to date and, where found advisable, details of replacement will be revised and extended to suit new considerations that are bound to arise.

With his recommended proposals approved the division manager does not have to draw up another detailed justification for each new piece of equipment as would be needed were it not included in the general plan of modernization. The executive committee, on the other hand, has the advantage of setting the company's replacement policy from a broad viewpoint and can make its decisions with far greater assurance than by passing on individual items alone.

Ansonia-Derby_____
Center_____
Primary_____
Secondary_____
Specialized_____
Service_____
Type_____
Over 10 yrs. old___

MACHINE TOOL SURVEY

Symbol_____ Size and Make_____

Installed_____ Appraised 1914-1918_____ New or Used_____

Factory Rebuilt or Major Overhaul_____ Rate_____

Installation Cost or Appraisal Value____ Book Value 12/31/35_____

Actual Hrs. Operated to 6/1/34_____

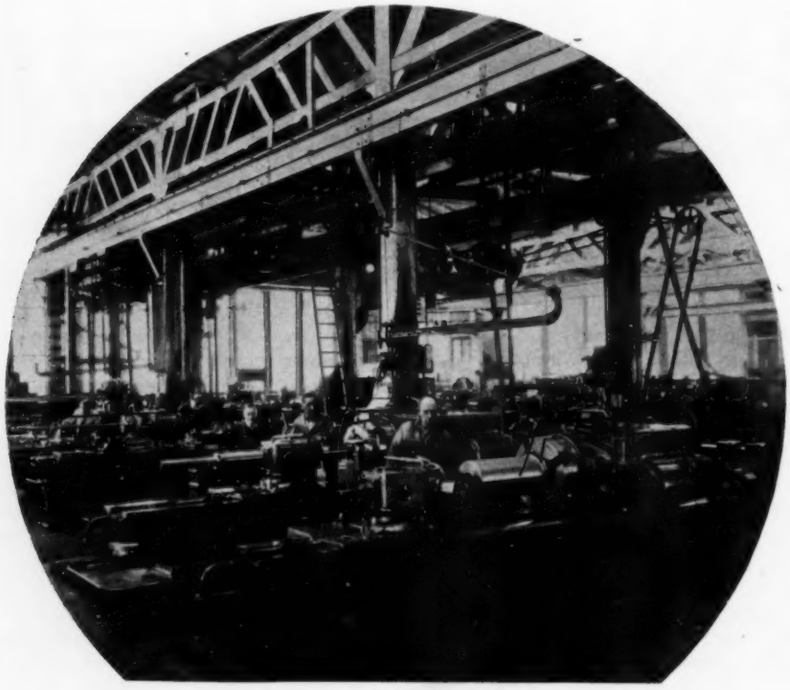
Group Hrs. 6/1/34 to 10/1/35_____ Budget Hrs._____

Total Hrs. Operated_____ Average Hrs. Per Year_____

Repairs to Date_____

1. Is machine accurate?_____
2. Has it sufficient speed to use tungsten carbide?_____
3. Can it take a heavy cut?_____
4. Is it equipped with rapid traverse?_____
5. Anticipated major repairs - Approx. date_____ Est. Cost____
6. What would a new machine do in comparison?
   Increase production?_____ How much?_____
   Reduce maintenance charges?_____ How much?_____
   Save floor space?_____ How much?_____
   Reduce skill required to operate?_____
7. Classification: Latest design____ Replace_____
   Fairly modern____ Retain_____
   Obsolete____ Sell_____
   Useless____ Scrap_____
8. Comments:_____

Items above the double rule were obtained from company records; those below from the foreman in charge. One of these sheets for each piece of equipment forms a basis for determining obsolescence

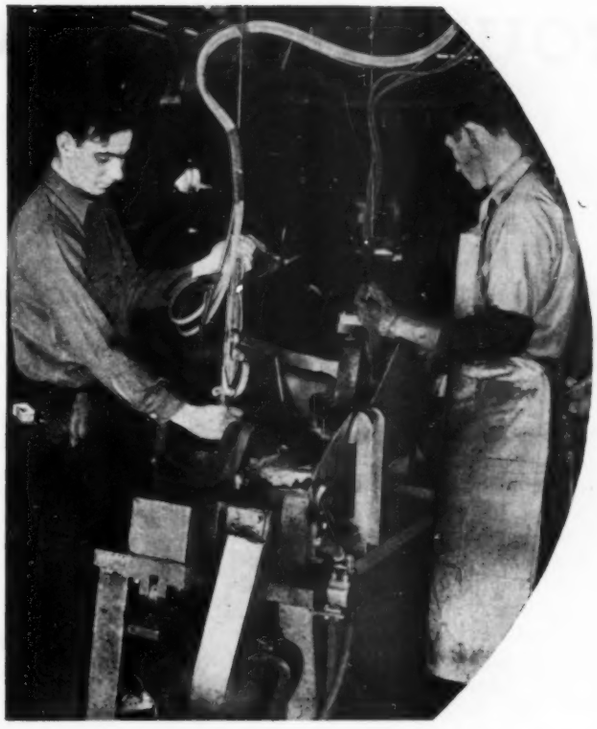


Two new turret lathes purchased as a result of the Farrel-Birmingham machine tool survey are already at work

In the method of approach outlined here may be found a solution for many managers who are aware of the need of equipment replacement, but who are at a loss as to how to "sell" the idea to those finally responsible for appropriations. A clear statement of physical condition, a review of recent changes, an estimate of the savings anticipated, a comparison with industry in general and concrete recommendations for new machinery convinced Farrel-Birmingham officials that the proposed program merited their support. Similar presentations in other progressive concerns are equally certain to move forward-looking financial heads to action.

The daily chore of struggling along with inadequate production facilities can often be traced to failure of the man in charge to present his case so clearly. Only a well conceived program, clearly stated, will bring about the action needed.

The acetylene torch helps assemble the crank-case ventilating outlet pipe while it is held in a pivoted fixture



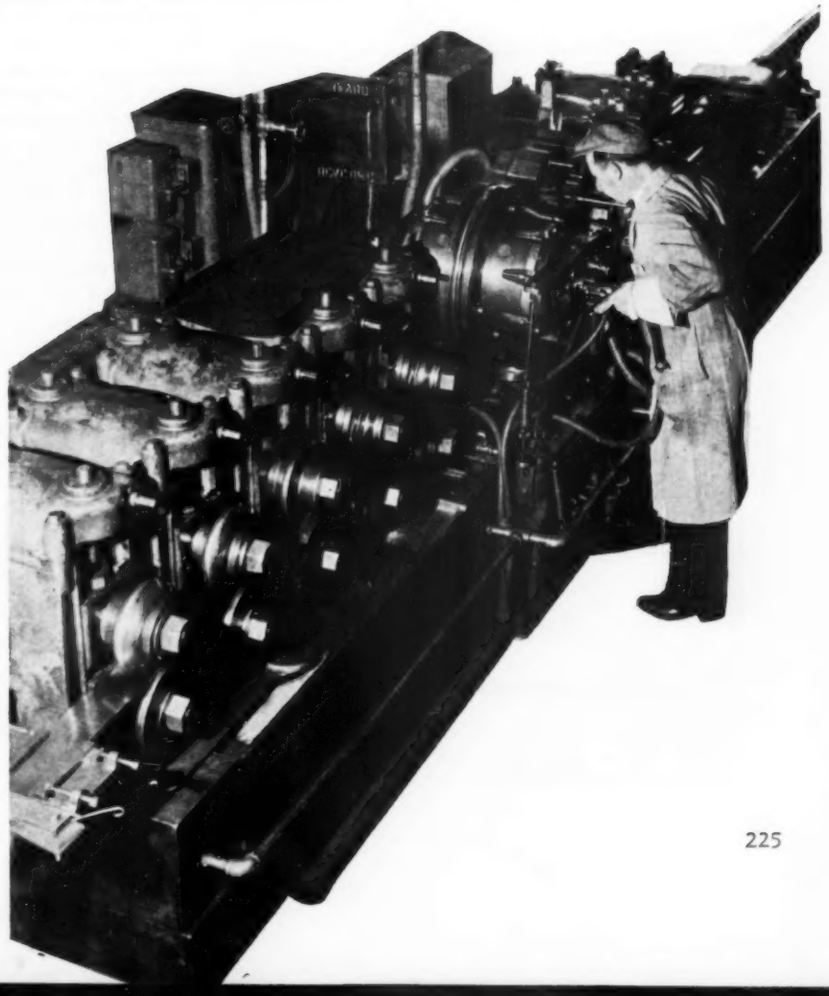
Held in a copper fixture, which also serves as an electrode, halves of the Pontiac radiator shell are spot welded together

PONTIAC WELDING . . .

MACHINE and MANUAL

●

Three distinct fusion operations typify the hundreds of varied welds used by this General Motors division



In goes the sheet and out comes tubing for tank filler pipes, exhaust pipes and muffler tails; welding is automatic

ROUNDING the CORNERS

B. SPECTOR

When a drawn shell needs a round corner, sheet metal methods often help the diemaker visualize his problem

TO SAVE the diemaker's time in making blanking dies for drawn shells, there should be furnished a drawing of the blank that appears correct to his experienced eye. Then, after the draw die is finished, he can cut a blank from heavy cardboard or thin sheet metal and try the die. As in the past he will probably need to make some modification in the blank, but it is certain that calculation of the blank will reduce the number of trials to a minimum.

The methods of the sheet-metal worker will aid the diemaker in visualizing his problems. If the sheet-metal worker were to make a square or rectangular box, he would use a sheet like Fig. 1, in which the dimensions of the piece are shown to be $(l + 2h)$ $(w + 2h)$, and he would cut out the four corners by the amount $h \times h$.

But sharp corners such as shown in Fig. 1 are not drawn in presses. It is true that small corner radii are drawn, but the smaller the corner radius the more difficult is the drawing operation. Regardless of the size of the finished corner radius, a reduction in the material at the corners must always be made corresponding to the notch $h \times h$ mentioned above.

The shell illustrated in Fig. 2 is drawn from the blank B. The calculations will be facilitated if it is assumed that a sheet-metal worker would make the shell from the blank shown in Fig. 3 in the same manner as he did in Fig. 1, bending along the lines L_1, L_2, L_3 and L_4. But to fill out each corner he would have to add a quarter of a cylinder of radius r and height h made of a rectangle $h \times \frac{1}{2}\pi r$.

When a circular shell of radius r and depth h is to be drawn from a disk, the diameter of the disk is:

$$D = \sqrt{4r^2 + 8rh} \quad \ldots\ldots\ldots (1)$$

Derivation of the value of X, Fig. 2, is made more understandable if the value of D is obtained by adding the areas of the various components of the shell and solving for D by applying the principle that the total area of the shell must equal the area of the original disk. Thus, in the shell the area of the base is πr^2 and the area of the cylindrical portion is $2\pi rh$, while the area of the original disk is $\frac{\pi D^2}{4}$

Therefore,

$$\frac{\pi D^2}{4} = \pi r^2 + 2\pi rh$$

Multiplying by $\frac{4}{\pi}$

$$D^2 = 4r^2 + 8rh, \text{ hence } (1).$$

For rectangular shells it is likewise true that the area of the blank must equal the area of the finished shell. If the sheet-metal worker did not wish to remove a square corner $h \times h$ as in Fig. 1, he would have to remove the surplus material at the corners in the manner shown in Fig. 4. Here the rectangular elements represent the material needed to make up the corner, while the triangles s_1, s_2, s_3 . . . . s_N represent the surplus material Let the

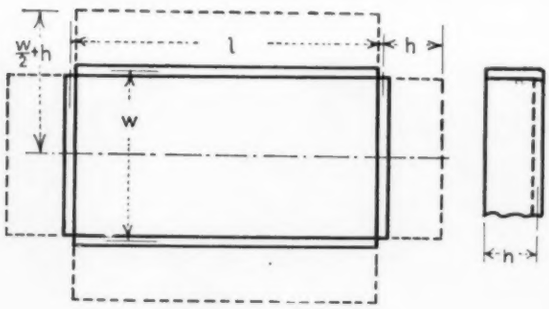


FIG. 1

Fig. 1—The sheet-metal worker's method of making a box is to notch the corners and fold up the flaps. Fig. 2—The blank B is the starting point in making a drawn shell. At F is shown the effect of making a shell very long in comparison to the width. Fig. 3—Each corner of this box can be filled with a quarter cylinder

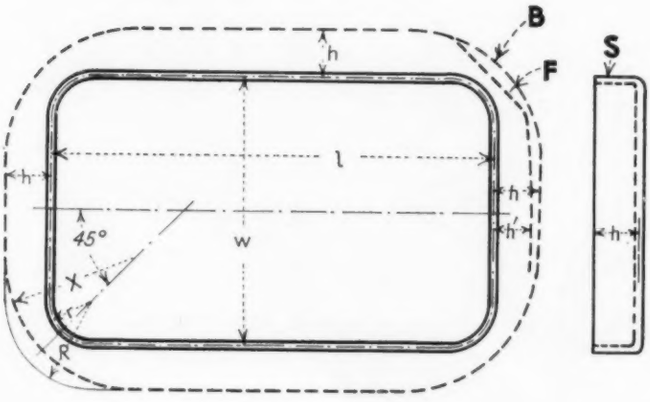


FIG. 2

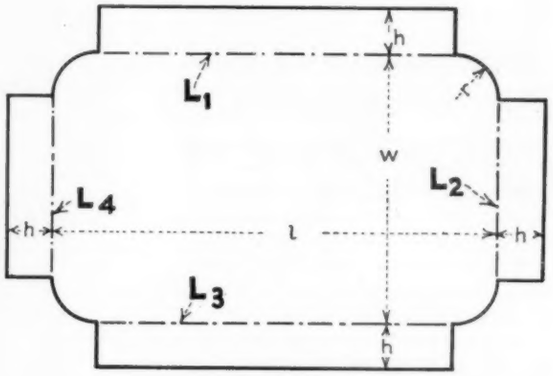


FIG. 3

surplus material be equal to A in Fig. 5. The shaded area a_1 is a quarter of a circle of radius X. The area a_2 is the difference between the square whose side is R (also $r + h$), and the quarter circle whose radius is R. Thus the surplus area is:

$$A = X^2 - \tfrac{1}{4}\pi X^2 - (R^2 - \tfrac{1}{4}\pi R^2)$$
$$= X^2 - \tfrac{1}{4}\pi X^2 - R^2 + \tfrac{1}{4}\pi R^2$$

Multiplying by 4,

$$4A = 4X^2 - \pi X^2 - 4R^2 + \pi R^2$$
$$= X^2(4 - \pi) + R^2(\pi - 4)$$
$$= 0.858X^2 - 0.858R^2 \ldots\ldots\ldots (2)$$

In order to eliminate the value of $4A$, refer to Fig. 6. Note that the area a_4, or the quarter of the cylinder mentioned above, is the area required, whereas a_3, or the quarter of the ring, is what we have. Obviously the difference between these two areas is the surplus area. Thus:

$$A = \tfrac{1}{4}\pi R^2 - \tfrac{1}{4}\pi r^2 - \tfrac{1}{2}\pi rh$$

But $h = R - r$. Then,

$$A = \tfrac{1}{4}\pi R^2 - \tfrac{1}{4}\pi r^2 - \tfrac{1}{2}\pi r(R - r)$$
$$= \frac{\pi}{4}R^2 - \frac{\pi}{4}r^2 - \frac{\pi}{2}Rr + \frac{\pi}{2}r^2$$

Multiplying by 4,

$$4A = \pi(R^2 - r^2 - 2Rr + 2r^2)$$
$$= \pi(R - r)^2$$
$$= \pi h^2 \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

But equations (2) and (3) equal $4A$, and hence

$$\pi h^2 = 0.858X^2 - 0.858R^2$$
$$X^2 = \frac{\pi h^2}{0.858} + R^2$$
$$= 3.66h^2 + R^2$$
$$X = \sqrt{3.66h^2 + R^2} \ldots\ldots\ldots (4)$$

For example, let $l = 5$, $w = 3$, and $h = r = \frac{1}{2}$ and $R = 1$. Then,

$$X = \sqrt{3.66\left(\frac{1}{2}\right)^2 + (1)^2}$$
$$= 1.385$$

The two methods of finding the corner allowance can be tested as follows: Fig. 7 shows the blank for a drawn shell, the value of X and the other dimensions being given as above. Then,

$$a_5 = X^2 - \tfrac{1}{4}\pi X^2$$
$$= X^2\left(1 - \frac{\pi}{4}\right)$$
$$= 1.915 \times 0.215$$
$$= 0.411$$
$$\therefore A = 2 \times 3 - 0.411$$
$$= 5.589$$

The blank made by the sheet-metal worker is shown in Fig. 8. He would

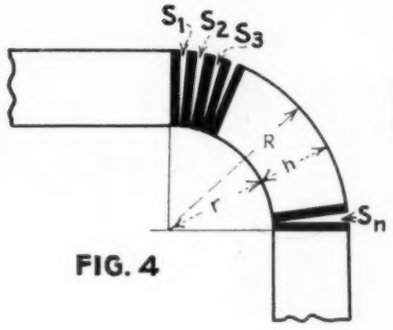


FIG. 4

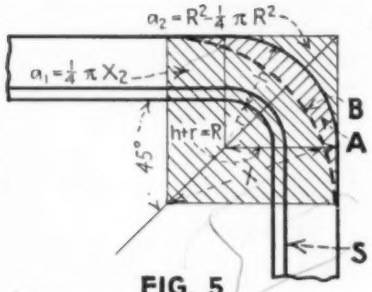


FIG. 5

Fig. 4—The quarter cylinder of Fig. 3 is equal to the quarter ring minus the surplus material represented by s_1, s_2, s_3, s_N. Fig. 5—the corner allowance is less than a quarter circle; it follows the line B. Fig. 6—The surplus material is equal to the difference between the quarter ring and the quarter cylinder a_4

bend along lines L_2 and L_3 as mentioned in connection within Fig. 3. The corner piece that he would have to add is a quarter cylinder, where r and h are both $\frac{1}{2}$. Then,

$$A = \tfrac{1}{2}\pi rh = \tfrac{1}{8}\pi$$
$$= 0.392$$
$$a_6 = 3 \times 1 = 3$$
$$a_7 = 2 \times 1 = 2$$
$$a_8 = \tfrac{1}{4}\pi r^2 = 0.196$$
$$\text{Total} = 5.588$$

The sum of these areas is the total area of the metal required, and checks the value obtained for the drawn shell blank. Sometimes the corners of the blank are straight as at F, Fig. 2. When the ratio of length to width l/w is large the value of h' is less than h along the side.

In the cases given the corner angles

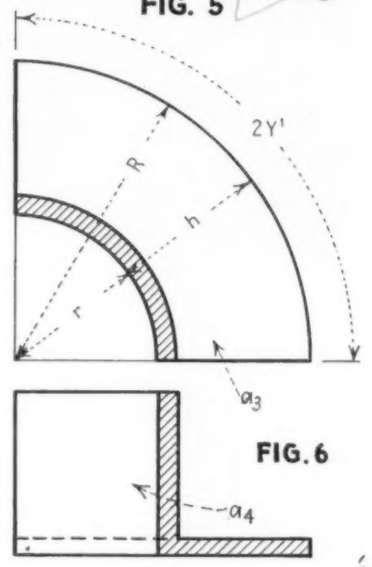


FIG. 6

all have been 90 deg. In Fig. 9 there is a shell for which the formulas developed do not apply. As angle Y becomes smaller, the reduction in the full corner radius becomes less, the latter approaching 0 as the Y approaches 0. The mathematical reason for finding X is the same as in the other cases. For convenience only one-half the area will be considered. In Fig. 9,

$$b = X' \tan Y'$$

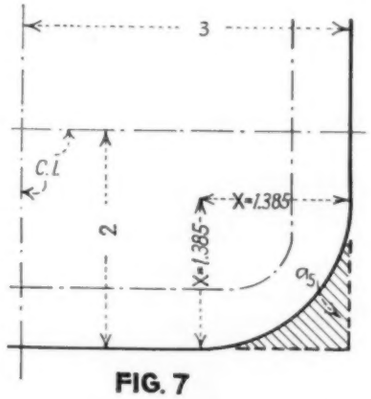


FIG. 7

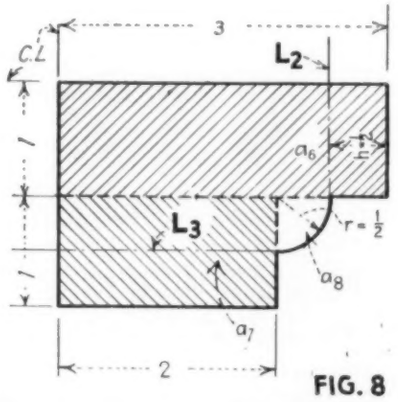


FIG. 8

Figs. 7 and 8—The calculations check for the quarter area of the blank whether done by the sheet-metal worker's method or the diemaker's method

Fig. 9—When the shell is not square or rectangular, the calculations of the corner allowance are effected by the included angle. Fig. 10—The major semi-axis A is lessthan the sum of a + h

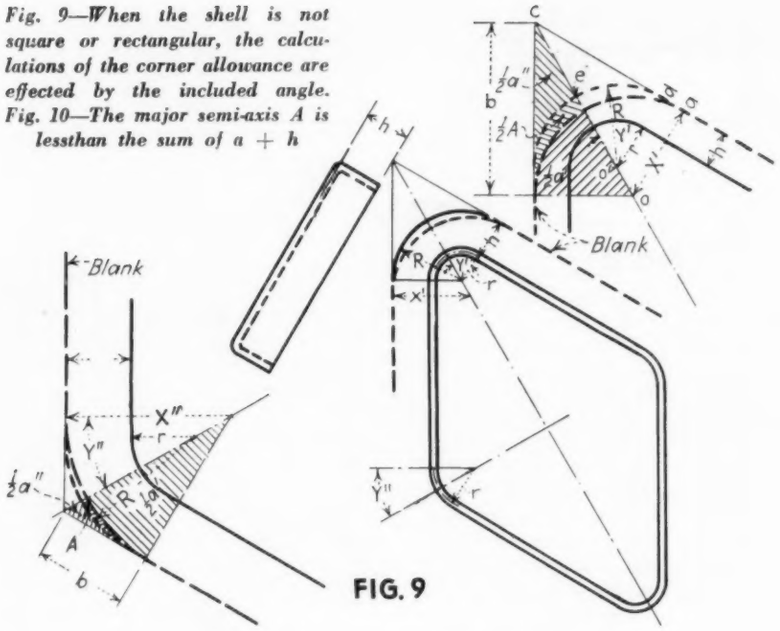


FIG. 9

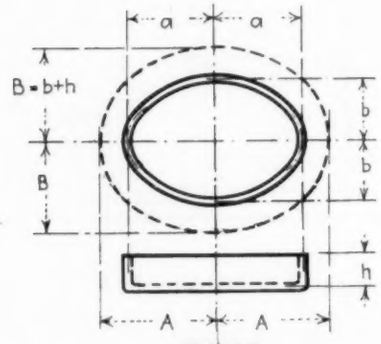


FIG. 10

the area $oac = \frac{1}{2}X'b$

$= \frac{1}{2}(X')^2 \tan Y' \ldots\ldots\ldots (5)$

$\frac{1}{2}a^1 = \frac{Y'}{360}\pi(X')^2$

where Y' is expressed in radians,

$$\frac{1}{2}a^1 = \frac{Y'}{2\pi}\pi(X')^2 = \frac{1}{2}Y'(X')^2$$

$$a' = Y'(X')^2 \ldots\ldots\ldots\ldots\ldots (6)$$

$\frac{1}{2}a''$ = triangle $o'dc$ minus sector $o'de$

$= \frac{1}{2}R^2 \tan Y' - \frac{Y'}{360}\pi R^2$

$= \frac{1}{2}R^2 \tan Y' - \frac{Y'}{2\pi}\pi R^2$

$= \frac{1}{2}R^2(\tan Y' - Y')$

$a'' = R^2(\tan Y' - Y') \ldots\ldots\ldots (7)$

The surplus area is:

A = twice triangle $oac - a' - a''$

$= (X')^2 \tan Y' - (X')^2 Y' - R^2(\tan Y' - Y')$

$= (X')^2 (\tan Y' - Y') - R^2 (\tan Y' - Y') \ldots\ldots\ldots\ldots\ldots\ldots (8)$

Referring to Fig. 6:

$$a_3 = \pi(R^2 - r^2)\frac{2Y''}{360}$$

$$= \pi(R^2 - r^2)\frac{2Y''}{2\pi}$$

$$= Y''(R^2 - r^2) \ldots\ldots\ldots\ldots\ldots (9)$$

$$a_4 = \frac{2Y'}{360}(R - r)2\pi r$$

$$= \frac{2Y'}{2\pi}(R - r)2\pi r$$

$$= Y'(R - r)2r \ldots\ldots\ldots\ldots\ldots (10)$$

But $A = a_3 - a_4$

$= Y''(R^2 - r^2) - 2Y'r(R - r). (11)$

Setting (8) = (11)

$(X')^2(\tan Y' - Y') - R^2(\tan Y' - Y')$

$= Y''(R^2 - r^2) - 2Y'r(R - r)$

By simplifying the right-hand side of the equation it becomes:

$(X')^2(\tan Y' - Y') - R^2(\tan Y' - Y' = Y'h^2$

$$(X')^2 = \frac{Y'h^2}{\tan Y' - Y'} + R^2 \ldots\ldots (12)$$

Let $Y' = 60$ deg. $= \frac{\pi}{3}$, $h = r = \frac{1}{2}$, and

therefore $R = 1$

Then $(X')^2 = \frac{\pi/3 \times \frac{1}{4}}{1.732 - \pi/3} + 1$

$= 1.382$

And $X' = \sqrt{1.382} = 1.175$

Let $Y'' = 30$ deg. $= \pi/6$

$$(X'')^2 = \frac{\pi/6 \times (\frac{1}{2})^2}{0.5774 - \pi/6} + 1$$

$= 3.363$

$(X'') = \sqrt{3.363} = 1.905$

To find the major semi-axis A for the blank of an elliptical box, find the total area of the shell as was done in the case of the square box. The area of the elliptical bottom of the box is πab and the area of the wall is $\pi h\sqrt{2a^2 + 2b^2}$. But the area of the blank is πAB. Therefore:

$$\pi AB = \pi ab + \pi h\sqrt{2a^2 + 2b^2}$$

$$\pi A(b + h) = \pi ab + \pi h\sqrt{2a^2 + 2b^2}$$

$$A = \frac{ab + h\sqrt{2a^2 + 2b^2}}{b + h}$$

Let $a = 1$; $b = 0.8$; $h = 0.4$

Then $A = \frac{0.8 + 0.4\sqrt{2 + 2(0.8)^2}}{0.8 + 0.4}$

$= 1.27$

Back to Day Rates

FRANK C. HUDSON

M. P. Dalton (*AM*—Vol. 80, page 6) makes some interesting comments on the article by Mr. Gordy on wage payment methods. In the third paragraph he makes, what seems to me, a common error regarding group bonus. Group bonus is applied to groups working on what we may call a sub-assembly, or a unit of the complete machine, if not on the machine as a whole. In such cases it does little good to have one fast man pile up certain parts of the unit. In fact it may add to the total cost, by adding to handling or accounting expense.

The greatest economy is where all parts flow along at maximum speed. Theroetically at least, group bonus tends to secure this condition by making the bonus to all depend on their cooperation. In some cases this has worked remarkably well, as fast men will help out the slower ones because it adds to their own bonus as well as to the others.

Another feature of group bonus that appeals to management is that the men themselves expose and crowd out the shirkers. And managers have told me that this is no small item in times when labor is scarce and positive.

It has been my observation that there are few cases in the modern shop where the abnormally rapid worker is much of an asset. In many cases he causes dissension that more than offsets his extra efficiency. If he has the proper temperament he can often be most valuable in showing the others how he attains his speed. But such teaching has to be done very tactfully, and few have the ability to teach men who are already pretty good without arousing antagonism.

Talking Shop

A Shilling Gage

Celebration of Watt's bicentenary this year in England and in the United States recalls vividly the state of the art of cutting metals a century and a half ago. Watt's steam engine was a failure until Wilkinson invented the boring mill that "bored us several cylinders almost without error; that of 50 in. diameter which we have put up at Tipton does not err the thickness of an

old shilling in any part," as Watt put it. Compare that with the split-thousandth limits of today and you have a picture of how far we have come in metal working since Watt's day.

Such careful political economists as Walter Lippmann are beginning to take it for granted that industry is handicapped by obsolete equipment. That used to be a subject for argument but when soil exhaustion is compared to obsolescence of industrial equipment, the argument stage is behind us. If only we could persuade the administration, and certain bankers and industrialists to adopt the same philosophy!

Transparent Envelopes

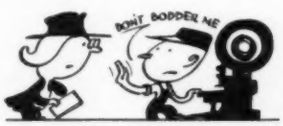
Envelopes have long been used to carry blueprints, routing instructions and time standards through the shop. One of the best modifications of this method is the transparent envelope which permits foremen and workmen to examine both blueprint and routing card without removing them.

Among the users of this plan is the Van Norman Machine Tool Company. This concern finds that the resulting cleanliness prevents errors in reading dimensions and saves time in handling the papers. The envelope, with blueprint and card inside, is clipped to the machine in plain view of the operator. The size used here is about 8x10 in., and detailed drawings of parts are made to fit. The envelopes make many trips through the shop before it is necessary to replace them.

Do suggestions pay? Ask the men who got $35,360 from the General Electric Co. in 1935 for 5,514 accepted suggestions, about one-third of the total submitted. In the last ten years over $500,000 has been paid to employees of G. E. for suggestions.

The Foreman Again

Just how concerned is the factory worker about the New Deal and the broad problems of industrial relations growing out of the depression? An interesting answer is given by an executive of a large corporation who has been learning the manufacturing side of the business the past four months by working on one job after another in the shop and living among the rank and file. Says he, "I have found an almost total absence of discussions revolving around the problems featured at Washington, such as the Wagner



Bill, the Social Security Act, or even the fight in the top ranks of the A. F. of L. The worker is surprisingly articulate, on the other hand, when it comes to his personal relations with the company, which, in turn, means his day-to-day, on-the-job relations with his foreman." All of which gets back to the fact that management can go a long way toward maintaining peace within its family by being sure it has the right kind of foremen—men who command respect as representatives of management, yet have a sympathetic understanding of the men under them and their problems.

The "American Automobile's" 1936 World Motor Census reports that 4,182,491 of the 5,157,562 automobiles built last year were manufactured in the United States and Canada. Total volume in 1928 and 1929 was higher, but foreign volume in 1935 set a new high. All in all, a pretty fair contribution to recovery from just one industry.

Plate for Queen Mary

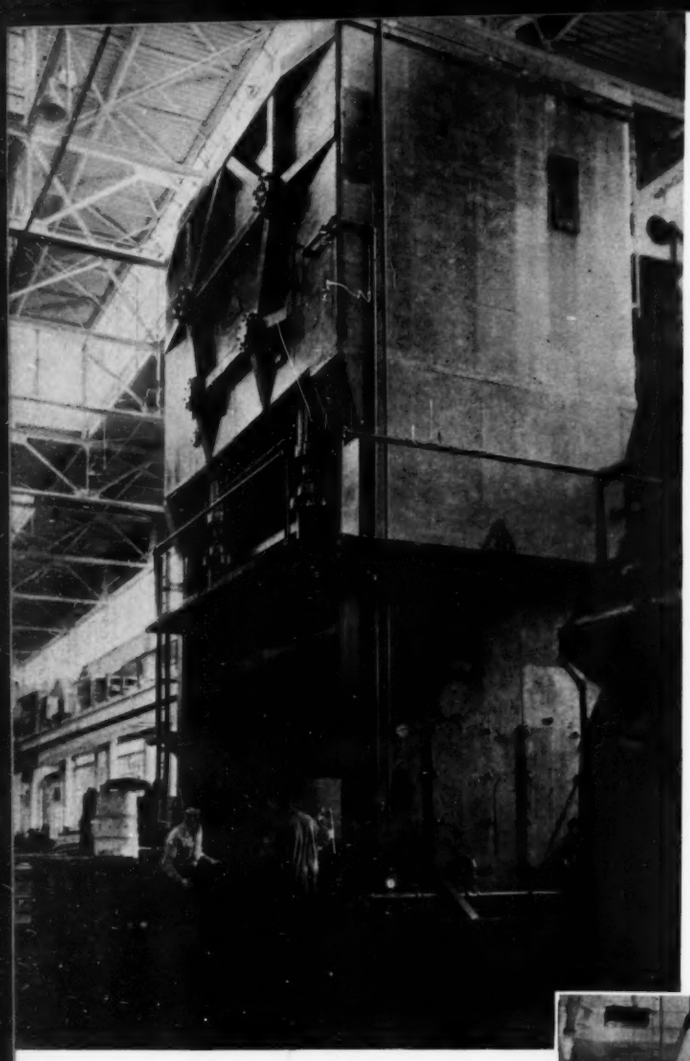
According to *Industrial Britain* an order for nine tons of electroplated ware for the Cunard liner *Queen Mary* has been placed with a Birmingham firm. The manufacture of 16,000 separate pieces is involved, ranging from large dishes to salt spoons. Between 600 and 700 people will be employed for four months and some 9,000 ounces of silver will be used in carrying out the work.

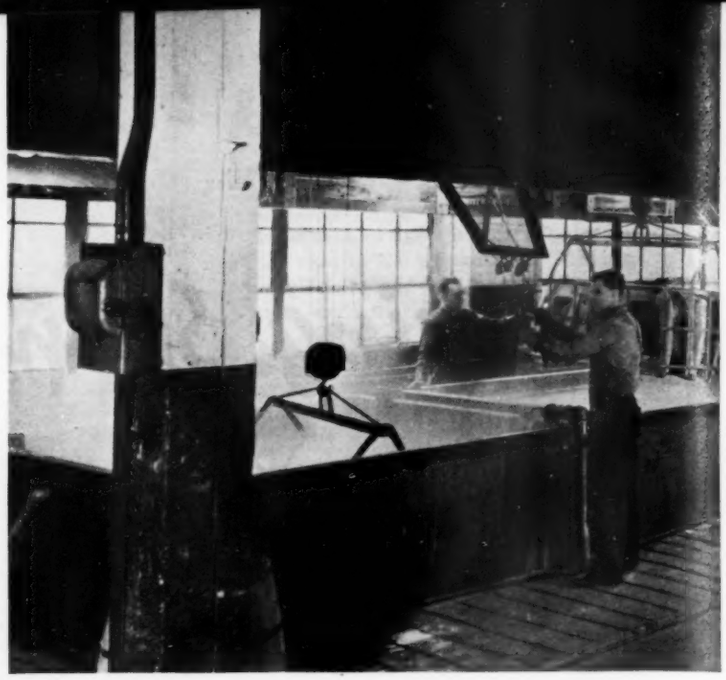
An economist named Speece has told a House committee that industrial machinery ought to be taxed to protect labor. In the good old days they used to talk about killing the goose that laid the golden egg.

Hard Irons

Most of us remember when the main job of the iron founder was to make castings soft; some of them were so soft they made mighty poor bearing surfaces. Then, in the case of lathe and similar machine tool beds, they began to use chills to harden the ways a bit. Now it is common practice to

add nickel, chromium and molybdenum to low silicon base irons and boost the Brinell hardness to get better wearing metal. This is true of both machine parts and cylinder blocks for motors. Without our high-speed steels and better cutting materials of other types, the increased hardness would be quite a handicap; which indicates how various elements tie in together to make a better whole.—*The Editors.*





STAMPED STEEL LIGHTENS

A Goliath—At a pressure of 1,500 tons, bath tubs are turned out by this huge machine at a rate of 53 an hour; the die alone weighs 500 tons

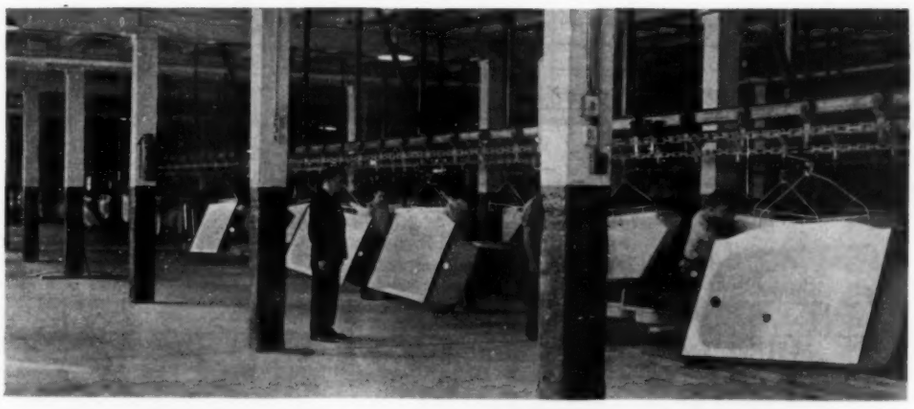
Special portable welders, designed and developed by Briggs engineers, assemble brackets to bathtub bottoms

In large box-type furnaces, provided with mechanical chargers, the enamel coating is fused to the metal

Parts are carried by special fixtures through a seven-bath pickling set-up to remove the last traces of foreign substances

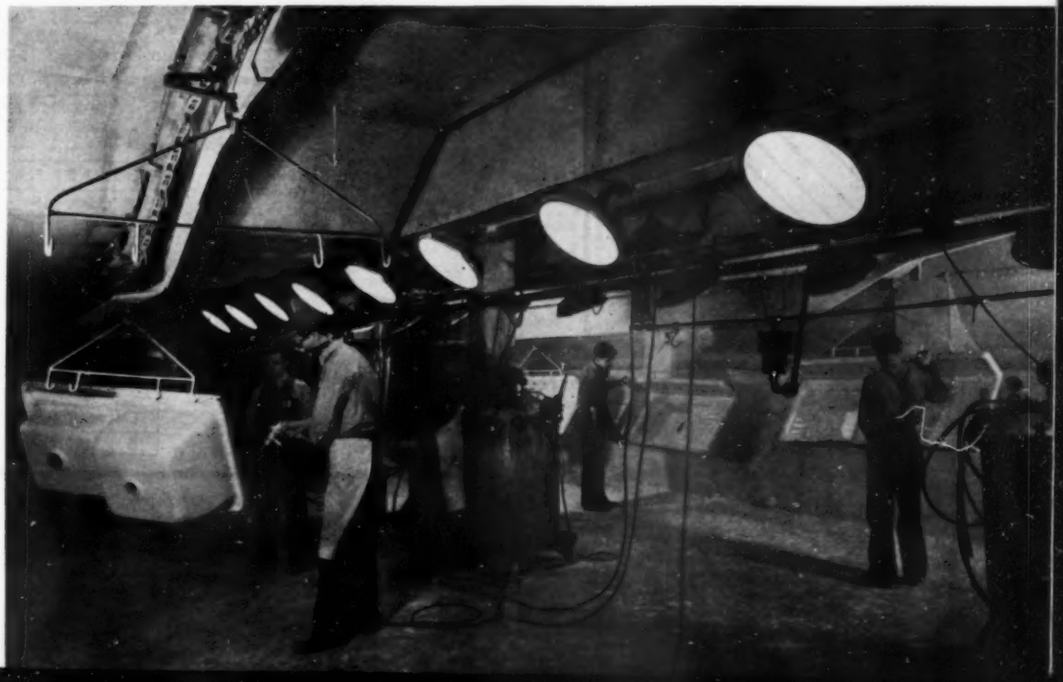
An 80-lb. sand blast, prior to enameling, roughens the surface and makes the priming coat adhere better

SANITARY WARE



After enameling the parts are conveyored through drying ovens and then carefully inspected for flaws

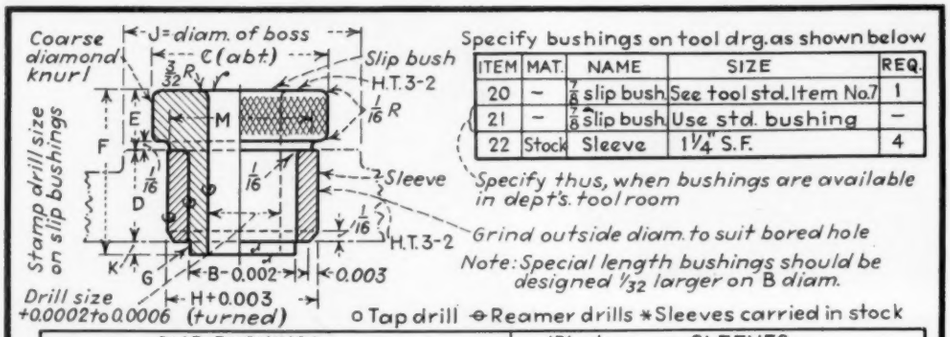
Overhead monorails carry the work through air-filtered booth, while acid-resisting enamel is sprayed on



RECENTLY the Briggs Manufacturing Company began the manufacture of stamped steel bath tubs, lavatories, kitchen sinks and other plumbing ware, having a third the weight of cast iron and priced competitively. The company's Hamtramck plant has been modernized to apply to the new line volume methods similar to those used in the automobile industry. This division is now running on three shifts, 24 hours a day.

TOOL DESIGN STANDARDS AID the SHOP

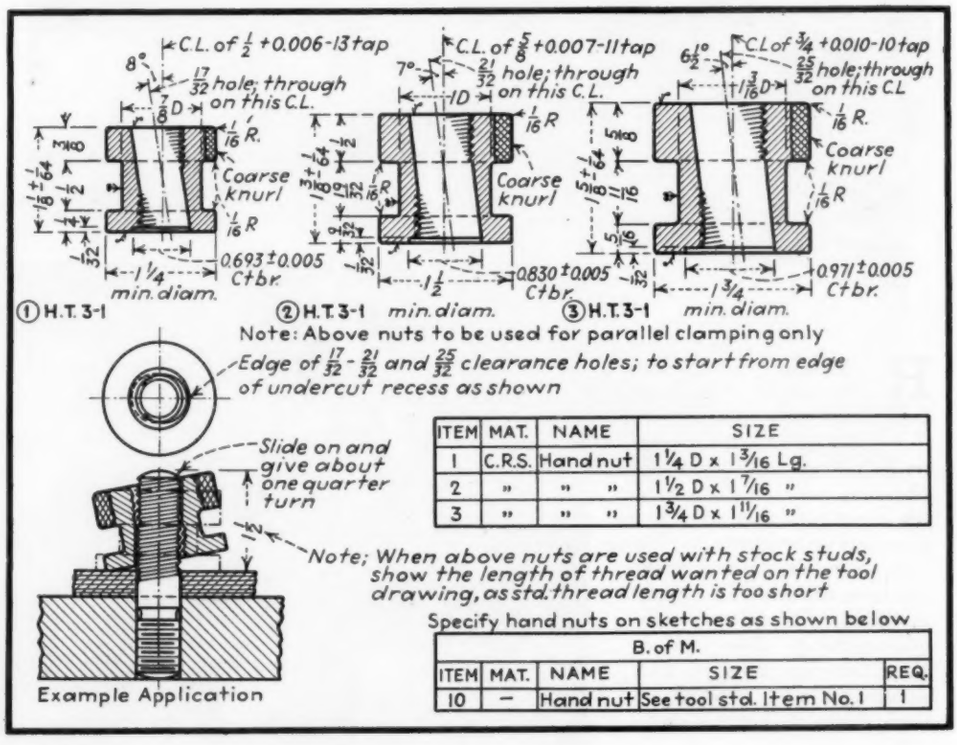
J. J. HUBER
Westinghouse Electric & Manufacturing Company



ITEM	MAT.	NAME	SIZE	REQ.
20	–	7/8 slip bush	See tool std. Item No. 7	1
21	–	7/8 Slip bush	Use std. bushing	–
22	Stock	Sleeve	1 1/4" S.F.	4

	SLIP BUSHINGS											Plug Gage B	SLEEVES						
	Item	DRILL SIZE	B	C	D	E	F	K	M	Mat.	Stock Size	Item		D	H	J		Mat.	Stock Size
o	1	49/64	1.250 1.2497	1 5/8	1 1/8	9/16	1 13/16	1/8	3/8	No. 3 TS	1 3/4 D x 1 7/8 Lg.	16*	1 1/4 S.F.	1 1/8	1.635	2 3/4	1.625	No. 3 TS	1 3/4 D x Lg.
⊖	2	.8065	"	"	"	"	"	"	"	"									
o	3	51/64	"	"	"	"	"	"	"	"									
	4	13/16	"	"	"	"	"	"	"	"									
⊖	5	55/64	"	"	"	"	"	"	"	"									
⊖	6	.869	"	"	"	"	"	"	"	"									
o	7	7/8	"	"	"	"	"	"	"	"									
o	8	59/64	1.375 1.3747	1 3/4	1 1/4	9/16	2	3/16	1 1/2	"	1 7/8 D x 2 1/16 Lg.	17*	1 3/8 S.F.	1 1/4	1.760	3	1.750	"	1 7/8 D x Lg.
⊖	9	9315	"	"	"	"	"	"	"	"									
	10	15/16	"	"	"	"	"	"	"	"									
o	11	61/64	"	"	"	"	"	"	"	"									
⊖	12	63/64	"	"	"	"	"	"	"	"									
⊖	13	.994	"	"	"	"	"	"	"	"									
	14	1	"	"	"	"	"	"	"	"									
o	15	1 1/64	1.000 .999	1 1/8	1 3/8	5/8	2 3/16	3/16	1 5/8	"	2 D x 2 1/4 Lg.	18*	1 1/2 S.F.	1 3/8	1.887	3 1/4	1.875	"	2 D x Lg.

Standard slip bushings for 49/64 to 1 7/64-in. drills are specified on the drawings according to the sample material list at the top of this tool standard drawing


C.L. of 1/2 +0.006-13 tap
8°
17/32 hole; through on this C.L.
7/8 D
1/16 R.
Coarse knurl
1/16 R
1 1/4 min. diam.
0.693 ± 0.005 C'bor.
C.L. of 5/8 +0.007-11 tap
7°
21/32 hole; through on this C.L.
1D
1/16 R
Coarse knurl
1 1/2
0.830 ± 0.005 C'bor.
C.L of 3/4 +0.010-10 tap
6 1/2°
25/32 hole; through on this C.L
3/16 D
1/16 R.
Coarse knurl
1/16 R
0.971 ± 0.005 C'bor.
1 3/4 min. diam.
① H.T. 3-1
② H.T. 3-1 min. diam.
③ H.T. 3-1 min. diam.
Note: Above nuts to be used for parallel clamping only
Edge of 17/32 - 21/32 and 25/32 clearance holes; to start from edge of undercut recess as shown
Slide on and give about one quarter turn
Note; When above nuts are used with stock studs, show the length of thread wanted on the tool drawing, as std. thread length is too short
Specify hand nuts on sketches as shown below
Example Application

ITEM	MAT.	NAME	SIZE
1	C.R.S.	Hand nut	1 1/4 D x 1 3/16 Lg.
2	"	" "	1 1/2 D x 1 7/16 "
3	"	" "	1 3/4 D x 1 11/16 "

B. of M.				
ITEM	MAT.	NAME	SIZE	REQ.
10	–	Hand nut	See tool std. Item No. 1	1

A quarter-turn of this quick-acting hand nut suffices. The tool standard number is given in the material list because the item is not stocked

A thorough system of putting full information on drawings is well compensated by the savings made in tool manufacture

IN A corporation having five widely separated design offices and one large tool making department, the advantage of having a uniform method of making tool drawings can be readily appreciated. To develop, maintain and improve this plan, a standard parts and design book was made up and furnished each tool designer. This book proved rather inexpensive as it consisted mostly of rotoprints, 8½x12 in. Each book is numbered and the owner held responsible for its condition. A single book is ample for two or three men, but owing to low cost, individual responsibility, handiness and for sanitary reasons each man was furnished with a book.

In working up a design, especially a fabricated structure, the thickness of the plate or the size of rolled section involved is selected from the listed sizes stocked by the company. This saves delay in securing materials and unnecessary machining. These listed sizes are carried in the fabricating section of the tool department. A sheet showing the proper fillet welds for the various thicknesses of plates is also available for the tool designer.

For drill jig work there are several sheets covering "stocked" and design standard drill bushings. On each bushing sheet a sample bill of material is shown, indicating how the bushings should be specified on the jig drawing. If the bushing wanted is carried in the storeroom, it will be marked as "stock" but if it is not carried, reference is made only to the tool standard sketch. No detailing of the bushing is required as each group leader in the tool making department has a book, the same as the tool designer, thus saving designing, material ordering, estimating and cost computing time. Fixtures, molds, dies and benders are considered in the same way, applying necessary information from sheets on standard bolt slot, keys, lining-up pins, stripper bolts and screws, punches and springs.

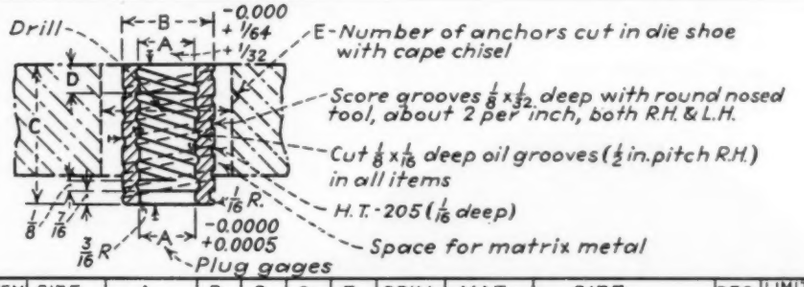
Details of the quick-acting hand nut illustrated, are given on a reference drawing only, as its activity does not warrant carrying in stock. A cheap but efficient method of securing guide or leader pin bushings in die shoes is also shown.

All designs of special tools are made in pencil on special printed paper forms, showing general manufacturing information, bill of material column and a title. Standard, stocked cutting tools, however, are traced with ink on cloth and are generally of the tabulated form.

Sheets covering various treatments of tool and low carbon steels, tolerances, finishes and fits are given to the tool designer so that he can furnish this information on the tool drawing. The time required to show this additional and essential information on the tool drawing has proved very beneficial in lowering the cost of tool manufacture.

Increase in Alloys

At the seventh International Congress of Mining, Metallurgy and Applied Geology, held recently in Paris, Sir Robert Hadfield, dean of British Metallurgists and inventor of Hadfield steel, pointed out that alloy steels now represent eight to ten per cent of the total actual world's steel production of approximately 80,000,000 tons. Furthermore one ton of alloy steel has supplanted three to five tons of ordinary steel and fulfills purposes for which ordinary steel could never be employed.



ITEM	SIZE	A	B	C	D	E	DRILL	MAT.	SIZE	REQ.	LIMIT PLUG GAGES
1	1 x 2½	1.0000	1⅝	2½	–	8	2⅛	C.R.S. P.D.1556	1¾ D x 2⅝ In. Lg.	1	62163-081
2	1¼ x 3	1.2500	1⅞	3	–	10	2⅜	H.R.S. P.D.1555	2 D x 3⅛ In. Lg.	1	81143-J8
3	1½ x 1½	1.5000	2¼	1½	–	12	2¾	C.R.S. P.D.1556	2¼ D x 1⅝ In. Lg.	1	81143-E11
4	1½ x 2	"	"	2	–	"	"	"	" x 2⅛ " "	1	" "
5	1½ x 2½	"	"	2½	–	"	"	"	" x 2⅝ " "	1	" "
6	1½ x 2¾	"	"	2¾	½	"	"	"	" x 2⅞ " "	1	" "
7	1½ x 3¼	"	"	3¼	1	"	"	"	" x 3⅜ " "	1	" "
8	2 x 2¾	2.0000	2¾	2¾	–	16	3⅜	"	2¾ D x 2⅞ " "	1	81143-J6

Specify bushings on sketches as shown below

B. of M.				
ITEM	MAT.	NAME	SIZE	REQ.
12	Stock	Guide Pin Bush.	1½ x 2¾	4

All items carried in stock

By scoring the bushing and cutting anchors in the die shoe, the guide-pin bushing can be securely held with cast matrix metal

"CO-OP" APPRENTICESHIP

K. H. CONDIT
Editor

From the theoretical part of the training of apprentices at Textile Machine Works has grown a full-fledged junior engineering college

TO MACHINE tool men the Reading plant of The Textile Machine Works has been known for years as one of the show places of the industry. Its housekeeping is very nearly perfect; chip disposal and sweeping is a continuous process, and so is the activity of the painting crew. Hardly any of its equipment is over ten years old, and it boasts of its early conversion to direct motor drive.

In such surroundings it is not surprising to find an apprentice training program that goes beyond most of the ones I know anything about. Those at the head of this program believe that training boys to meet present shop conditions and requirements is not enough; that what is needed is training that will fit them to be supervisors ten or fifteen years from now when technical advance will have changed things in the shop materially.

Any such philosophy implies the necessity of an appreciable amount of theoretical instruction. The course has therefore been divided into terms made up of four-week shop periods and four-week classroom periods, two groups of boys alternating between the two as in the cooperative engineering courses at the University of Cincinnati, Antioch College and other schools. One advantage of this arrangement is that if a boy fails to make a good showing in his school period he may switch over to the alternate group and repeat the period to catch up.

Although the idea of supplementing practical trade training with theoretical education had been attractive to Messrs. Thun and Janssen, founders of Textile Machine Works, for a number of years, it was not until 1927 that a start was made in the basement of the firm's dispensary building where four rooms were fitted up to accommodate the three instructors and 32 apprentices. These quarters were outgrown in 1930 and the school was moved to a reconstructed church building.

Two years later the facilities of the school were made available to apprentices from other Reading industries, and to individuals, and in 1933 it was incorporated as the Wyomissing Polytechnic Institute. Shortly thereafter a regular junior engineering college curriculum was added and the Institute was granted full junior college credit by the Department of Instruction of the State of Pennsylvania.

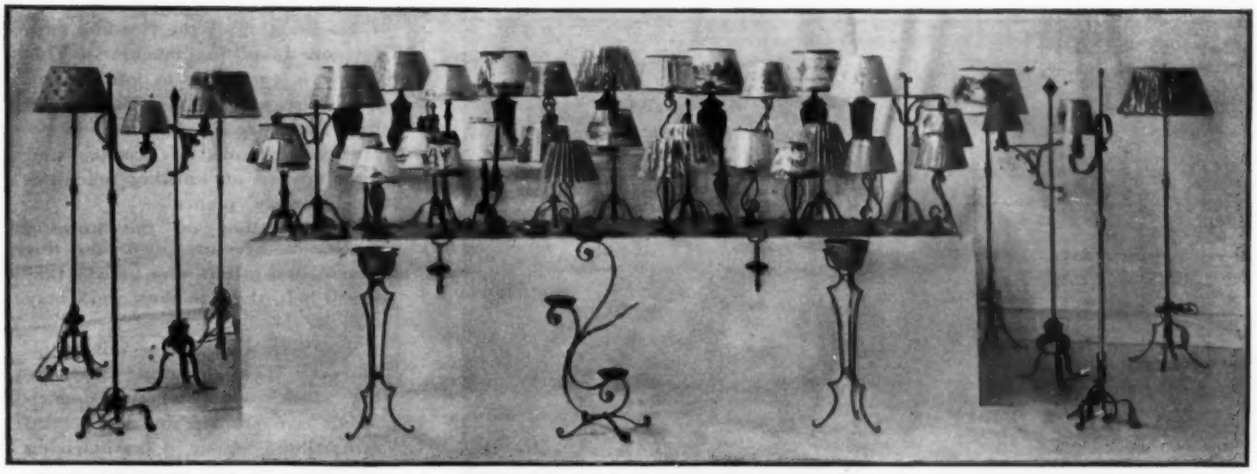
The staff of nine instructors is headed by President Arthur C. Harper, an educator with many years of successful experience in engineering teaching. Applicants for admission are accepted in September or in February after suitable examinations into character, aptitude and scholastic attainment. They are considered as employees of the plants from which they come and are paid for the work they do in those plants, an average of about twelve dollars a week over the four years. The tuition fee for the work in the Institute is $75 a term, or $150 a year and is usually paid by the employer. Applicants who are not employed may matriculate by paying the fees, and can generally secure jobs for their practical training.

During the first two and one-half years of the course the work alternates between classroom and shop. During the remaining year and one-half it is all in the shop. Most of the boys continue with evening and Saturday morning courses at the Institute after completing their classroom work, or else take extension courses from other schools.

The term consists of 22 weeks, 11 in the shop and 11 in the school. The remaining eight weeks of the year are put in in the shop. There are no vacation periods because the alternation between theoretical and practical work provides sufficient diversification in effort and affords real stimulation of interest. One of the by-products of this type of course is the effect on the instructors, both in the classroom and in the shop. Each has to keep constantly abreast of latest developments to be able to answer the questions fired at him by boys that have just come from the other environment.

Cooperating companies, in Reading and elsewhere, include: Carpenter Steel Co., Dick Brothers, Inc.,

On Saturday morning, and between 4 and 5 on other days, apprentices are taught to make such tools as these for their own kits



In the weeks before Christmas apprentices can use their free time in the shop in constructing lamps and other presents

Excelsior Brass Works, Hudson Silk Hosiery Co. of Charlotte, N. C., Northeast Lumber Co., Parish Pressed Steel Co., Penn Hardware Co., Progressive Machine Works, Reading Iron Co., Textile Machine Works, Merritt Lumber Yards, Reading Hardware Co., Reading Pratt & Cady Co., and A. Wilhelm Co. President Harper will be glad to receive inquiries from other companies which may wish to send boys to Wyomissing.

The classroom schedule is given in full, see table, to show the breadth of training given to the apprentice. Note particularly the courses that will be of value to the boy who rises to supervisory positions.

Since the shop training at Textile Machine Works is confined rather closely to the manufacture and assembly of knitting machine and braiding machine parts, provision is made for additional metal-working training from 4 to 5 each afternoon and from 7 to 12 on Saturday morning. Much of the work done in these periods is hand craft but it is quite possible for the apprentice to make for himself a set of machinist's tools that would cost at least $150. Above is a group of lamps and similar products made by apprentices during the weeks before Christmas. To the left are some of the hand tools made by the boys.

Boys from the Textile Machine Works may get training in any one of the following trades: general machinist, toolmaker, diemaker, draftsman, wood patternmaker, moulder, electrician, tinsmith. The boys who enter for the last four trades go at once to the respective departments concerned. Those who want to be draftsmen get from one and one-half to two years in the shop before going into the drafting room.

General machinist and tool- and diemaker apprentices are routed systematically through the 21 departments of the plant. Each boy gets a specified minimum of time in every department but if he is slow at grasping the fundamentals this time is extended. Also, if

Curriculum of theoretical training given to apprentices at Wyomissing Polytechnic Institute

FIRST YEAR

First Semester	Hours Per Week			Second Semester	Hours Per Week		
	Class	Lab.	Total		Class	Lab.	Total
Inorganic Chemistry	3	3	6	Inorganic Chemistry	3	3	6
Physics-Mechanics	5	6	11	Physics-Heat	3	3	6
Engineering Drawing	0	6	6	Descriptive Geometry	2	6	8
Algebra	5	0	5	Trigonometry	5	0	5
Composition	3	0	3	Composition	3	0	3
Shop Theory	3	0	3	Shop Theory	3	0	3
Hygiene	1	0	1	Principles of Economics	4	0	4
Study	5	0	5	Study	5	0	5
	25	15	40		28	12	40

SECOND YEAR

Qualitative Analysis	2	4	6	D. C. Electricity	4	3	7
Electricity & Magnetism	3	3	6	Kinematics	4	4	8
Engineering Drawing	0	6	6	Strength of Materials	5	3	8
Mechanics	5	0	5	Knitting Machine or Elective	6	0	6
Applied Mathematics	3	0	3	Corporation Finance	3	0	3
Principles of Economics	4	0	4	Shop Theory	3	0	3
Shop Theory	2	0	2	Study	5	0	5
Advanced Composition	3	0	3		30	10	40
Study	5	0	5				
	27	13	40				

THIRD YEAR

First Semester	Hours Per Week		
	Class	Lab.	Total
A. C. Electricity	4	3	7
Machine Design	4	6	10
Empirical Design	0	8	8
Economics-Industrial Management	4	0	4
Heat Engines	3	3	6
Study	5	0	5
	20	20	40

At an "open house" held last fall 25,000 parents and friends flocked to the shop to see the kind of work done there

a boy shows particular interest in any department he is allowed to spend extra time there. Upon completion of the training course the apprentice receives a bonus of $200, and is eligible to try for a scholarship in one of several Pennsylvania engineering colleges.

The success of the voluntary periods each afternoon, and on Saturday morning, was so marked that it led to a demand for similar opportunities for other employees in the plant. To satisfy this demand these courses have been established:

1—Bench work, including filing, chipping, scraping, fitting and assembling. This course is available to most of the men in the various shop departments.

2—Erecting of the Reading full-fashioned knitting machine. This course is open only to journeyman machinists who are ambitious to get into the more responsible and remunerative work of erection and maintenance of knitting machines in customers' plants.

3—Operation of the knitting machine. Erectors must take this course, and others who believe that it will help them in their work may take it.

4—Clerical work for office employees. The planning, timekeeping, stock room and cost departments are studied in detail, and some time is spent in familiarizing students with the operation of the knitting machine.

The response of the employees to these courses has been gratifying and has enabled the management to maintain a policy of promoting from within the organization. Courses are conducted during the employees' free time, and the instruction and equipment for them is provided by the company.

Periodically the Textile Machine Works officials hold an open house in the shop to permit parents and friends of the boys, and other members of the community, to see the plant in operation and to examine the work done by apprentices. 25,000 people came to the last of these affairs, held in October under the handicap of very rainy weather.

DIE DESIGN and DIE MAKING

A STROKE of the press takes only a few seconds, but behind it lie hours of skill and ingenuity in die design and die making. Dies are costly, and men who can make ones that will produce clean stampings are always in demand.

THE MODERN automobile, the radio, the mechanical refrigerator, the streamlined train, in fact, practically every new manufacturing development, leans heavily on the products of the press. Stamped parts have invaded every branch of the metal-working industry, replacing other materials and other methods of fabrication.

TIMELY, therefore, is this announcement of a series, on "Die Design and Die Making," to start in these pages in an early number. The author, E. G. Marshall, formerly chief tool designer of the Dalton Division, Remington-Rand, Inc., is now associated with the American Fork & Hoe Company. He brings to these articles his own years of practical die work and the combined experience of many die designers and die makers who have aided in their preparation.

MODERNIZING AN ARSENAL

III—In an arsenal, standby and emergency equipment needs provide variations from the ordinary replacement problems. This concluding article leads up to a sound recommendation for an arsenal equipment replacement policy

D. G. McGregor
Captain, Ordnance Department, United States Army

THE specification and procurement of machines to meet an existing need, and the adaptation of this equipment to present operating conditions have been discussed in previous articles. If modernization is desirable now, it will be equally advantageous when today has become yesterday and the recently procured machines may be outmoded. It is the purpose of this article to show the need for keeping up to date, and to suggest a replacement policy which will be sufficiently economical to be practical, will lighten the emergency load on the machine tool industry, and will provide a definite sphere of usefulness for equipment as obsolescence approaches.

The dual mission of the ordnance manufacturing arsenal, wherein current manufacture and development are combined with plans and training for possible emergency operation, offers an excellent illustration of the need for compromise between present and future. As long as the need for national defense exists, there will be a need for an adequate source of supply of munitions. Without discussing the nature of this demand, it will be evident to all who know of the industrial problems of the World War that the rate of change of the production load in time of national crisis is a serious factor.

The manufacture of any complicated piece of apparatus requires trained personnel and suitable equipment, and the complexity of military apparatus calls for the ultimate in both men and machines. While the need for a product continues, the specific arts and practices required in its manufacture must continue. Where the number of producers is limited, the responsibility of each is increased. As the art of war becomes more scientific and mechanical, the principles of adequate defense require that development of the tools of warfare keep pace with the advances of science and industry. The arsenal's peacetime activities of limited production, repair and development serve to maintain the essential nucleus of a trained manufacturing personnel, and to perpetuate and improve highly specialized processes. All of this work must be done as efficiently and economically as possible to obtain maximum results with minimum expense, which requires high class equipment.

In time of emergency, when all available industrial resources of the nation are required for the production of munitions, the arsenal's program calls for quantity production of a few standard items. In addition to increasing its own productive capacity, and expanding its force, it must act as a center of training and technical information for industrial plants which are changing over to an unfamiliar program. Ability to handle the emergency load efficiently requires that machine tools procured by the government be suited to this mission also.

Need for New Machines

Probably the most insistent demand for modernization of equipment in any plant arises from changes in product. These changes are usually due to market influences which call for improvement of the article, reduction in price, or both, and apparently the designer has very little idea how or with what his design will be brought into being. Improved interchangeability and increased accuracy can be accomplished quite simply on the drawing board by moving a decimal point. The practical result may be to move the job off every machine in the shop. By the simple expedient of narrowing manufacturing tolerances, the designer can — and sometimes does — unconsciously specify the expenditure of thousands of dollars for new equipment, tools and even measuring instruments.

For example, a tolerance of two thousandths on a two-inch diameter may be commercially possible on a large range of equipment, but if this is narrowed to two ten-thousandths, a precision machine, special holding fixtures, diamond tools, sharpening tools, and wide range indicators are needed.

Frequently the need for new equipment arises from causes not influenced by design. Worn out equipment must be replaced, and usually the new item will have operating characteristics radically different from the old. Changes in the character of raw materials, often from causes outside the plant's control, usually require modification in the methods of fabrication, even to the extent of new tools. Changes in method for economic reasons (from turning to grinding, from machining to broaching, or increased use of welding) obviously call for new facilities and revised thinking in all departments.

Mention has been made in a previous article of the effect of new equipment on operating schedules. At Watervliet Arsenal about eighty modern machines were secured and placed in operation during the past year, and while sufficient time has not yet elapsed for accurate comparisons with old machines to be made, instances of material time savings have occurred. On a job formerly requiring approximately 1,750 hrs. of direct labor to machine each unit, the time has been reduced to about 1,200 hrs. Making proper allowance for greater familiarity with the work, and better administrative control, it is still evident that much of the credit is due to new and suitable machines.

An internal precision thread was formerly cut on either a modified horizontal boring machine, or a specially

adapted lathe. A new horizontal boring, drilling and milling machine with high accuracy threading attachment showed an immediate reduction in time of ten per cent with improved finish and accuracy. Deep drilling previously done on horizontal boring machines is now done on the special machine described in the preceding article, in less than half the former time. Seven new turret lathes have permitted a greater variety of work to be done on this equipment with materially less spoilage of work, although marked saving in time is not yet apparent.

The incidental advantages of new equipment are not so evident from immediate inspection of production records but will be reflected ultimately in total operating costs. Ease of operation, and simplicity of control, accuracy and reliability of movements of machine units, relieve the workman of unproductive effort and remove many mental hazards, permitting him to concentrate on his job, confident that the machine will respond to his demands. The presence of modern, high quality, accurate equipment conveys to the shop personnel that the management expects a high quality, accurate product. It is only natural that these factors should result in more efficient and economical operation.

"New" Implies "Modern"

It can be accepted as axiomatic that the need for new machine tools in industry (government and private) exists today and will always exist. The only proposition which needs constant exposition, and is susceptible of argument, is the extent of the need or the actuality of a specific requirement. Percentages figures applied to equipment groups have been used in recent discussions of the need for a reequipment policy, by emphasizing average age as a basis for modernization. There is always danger in accepting statistical data without critical inquiry into the point which such statistics are designed to prove.

Recent efforts to obtain certain particular types of machines suggest that hesitancy on the part of manufacturers to replace machines may be due in some cases to the trend of machine tool design, in which some items are improved as frequently and radically as the automobile, whereas others are entirely overlooked. Still another deterrent to replacement is the fact that some basic heavy duty machines almost never wear out with intermittent use, and radical redesign would be needed to justify the replacement of a fifty thousand dollar machine which is far from worn out.

It can be accepted as axiomatic that the need for new machine tools in industry (government and private) exists today and will always exist. The only proposition which needs constant exposition, and is susceptible of argument, is the extent of the need or the actuality of a specific requirement

Large gun boring lathes, for example, are not greatly outmoded even though they may be fifteen or twenty years old. Slotters of 18- to 24-in. stroke which have the same average age, may be considered as modern (if one must use such a slotter at all) since no machines of what we are pleased to term "modern design," are available. Grinding machines, on the other hand, have stepped quite far ahead with the use of hydraulic drive, permitting greater accuracy and faster metal removal, so that every big grinder without these features is in fact an antique, regardless of age. Big planers are attempting to assure their future by combining the functions of milling, boring and drilling with their conventional operations, emphasizing reduction of set-ups and maintenance of alignments rather than the improvement of any particular operation.

It would appear from the foregoing considerations that modernization is not entirely a function of average age of existing plant equipment, but more properly a comparison of efficiencies of existing facilities with those which are available to replace them. On the one hand, obsolescence will be the controlling factor and the extent of procurement should be no greater than the economies which can be effected from keeping up to date. On the other hand, wear and tear will govern the time of replacement, while the cost of maintenance and the expected use over a long period will indicate whether the advantages of a new machine are sufficient to justify the large investment.

Emergency Needs

The considerable and rapid expansion of manufacturing facilities called for in emergency production of munitions creates a demand for machine tools which is sudden and imperative, though temporary. If modern methods and equipment are desirable in normal times, they are vital in a crisis where delay may mean disaster. The emergency equipment requirements are provided, to some extent, by those portions of the arsenals which are in standby condition, where sufficient equipment is available for almost full capacity operation. The unprovided balance, both for the government and industry, must come from the machine tool builders at the time.

The temporary nature of emergency operation leaves a very considerable amount of equipment inactive for the major part of its service. Such of this equipment as is not subject to rapid obsolescence, and is expensive, should be kept in first class condition and should be of first class construction when obtained. Smaller machines of general purpose types frequently redesigned are usually so far outmoded when ultimately placed in service that they hinder rather than help production.

As changes in normal operating conditions are made, for reasons of economy and efficiency, these changes should be carried to the standby facilities as well. If industrial developments have shown that grinding is faster and more accurate than turning, then an emergency requirement for grinding machinery exists for the job in question. Furthermore, all the transition problems should have been solved prior to the emergency, the basic equipment designs completed and its procurement actually under way. Since it has been found commercially that broaching is faster than milling, the application of this method wherever practical should be made and suitable equipment obtained. Welded construction is already replacing castings

as rapidly as designs can be developed which will meet the arduous demands of military field service, so facilities should be available.

In theory, the normal operating plant should act as a receiving agency and proving ground for equipment to be used in a larger program. Unfortunately, however, until the recent modernization program was started, the standby facilities were required to serve as a reservoir of machines and parts thereof to keep the current plant going. A comprehensive reequipment policy is necessary if the arsenal is to be prepared for its emergency mission. Current procurement must be sufficient to keep normal facilities abreast of industrial developments, and to build up, gradually, a reserve of standby equipment which in design and condition will be adequate to emergency demands.

The picture of the future utility of current equipment would not be complete without a glimpse of the so called standby shop when the occasion arises to place it in operation. When conditions require that a portion of the plant be retired from service for an indefinite period, it may be assumed that the status of its equipment is comparable to the average for the establishment as a whole. When it is opened, however, it will be found to have suffered more from disuse than from obsolescence. The experience in opening a standby shop at Watervliet Arsenal about two years ago offered an example of what may be expected in any installation which is inoperative for a number of years, and incidentally reveals the degree of confidence that can be placed in the immediate usefulness of reserve facilities, unless extensive provision is made for maintenance.

In the first place, the reserve shop layout may not be adaptable to most efficient operation on the new schedule. It may be expected that in most cases considerable rearrangement is desirable, but since movement of machines is reasonably simple before production starts, we need not consider it as peculiar.

The second step, however, raises immediate difficulties. Normally, when a machine breaks, its immediate past performance is evident. When a machine which has stood idle for ten years or so breaks on the first job, the causes leading up to the breakage are not generally known. Machine elements that remain in contact for long periods through radical temperature changes with insufficient care will corrode or deteriorate, causing loss of accuracy or actual failure. A 36-in. lathe, which to all outward appearance was in first class condition, was found after installation to have the entire headstock mechanism completely rusted into a solid mass because of moisture condensation and the lack of sufficient oil. Obviously, careful examination prior to storage, and frequent thorough servicing will remove much of this trouble, but usually the economic need for reduced operation of any plant precludes all but the most superficial maintenance of this equipment.

A third factor, which is less apparent at once but more difficult and expensive to overcome, is the deterioration of electrical wiring, and piping for air, steam and water. Electrical floor connections which are not absolutely moisture proof (and how many are?) will offer inlets for moisture, and the combination of trapped water and disintegrated insulation are a team which will probably force the entire replacement of all enclosed wiring before the job is "licked."

A fourth complication will develop as soon as actual operation starts, which is similar to, but less gratifying than the preliminary operation of new machines. The actual serviceability and accuracy of the machines is probably forgotten by the shop personnel concerned. For instance, a certain 54-in. heavy duty lathe was found to check beautifully when idle and even when running with a ton of pot chuck on the faceplate. The lead screw indicated that the machine was entirely suitable for cutting a precision thread 12 in. in diameter, and permitting only a thousandth variation in lead. However, when the work, weighing two tons, was added in the chuck, the spindle run-out was over six thousandths. Correction of the spindle brought out errors in the gearing and finally the job was routed through another machine and the worn-out lathe was scrapped.

Current procurement of machine tools, with an eye to the future, has been stated as desirable where emergency conditions must be anticipated. In view of the ravages of time and the deteriorations of idleness, extensive purchase of valuable equipment which must certainly stand idle for long periods may be seriously questioned. Before attempting an answer it may be well to inquire into the probability of the machine tool industry being able to meet an emergency demand—not forgetting the exhibits which remain from the World War to show the manner of its past performance.

Deliveries of equipment purchased in the recent modernization program ranged from three to five months, on standard items regularly presented for commercial use and in reasonably small quantities. (Watervliet Arsenal's procurement amounted to from two to six machines per manufacturer, except in the case of small surface grinders, where the quantity was ten.) Although prominent machine tool executives have stated with assurance that, assuming designs to be available, the industry can meet emergency demand in four months, a reasonable doubt may be entertained on two counts.

First—rapid build-up in a machine tool plant is difficult because of its normal method of small lot production and the equipment suited thereto. And, second—the personal problem is more acute in the machine tool plant than elsewhere because of the character of the job and the accuracy requirements of the product, and skilled machinists are becoming increasingly rare. The ability of the machine tool industry to meet an emergency demand will depend on the extent of its operating capacity at the time and the ability with which it can compete with all other mechanical industries which are in the process of expansion too. Fairly large, self-contained plants may be equal to the strain, but much of the necessary high quality equipment comes from small shops which cannot multiply their normal output by ten overnight.

Before passing it should be noted that the undesirable practice of "farming out" the building of machines to

Modernization is not entirely a function of average age of existing plant equipment, but more properly a comparison of efficiencies of existing facilities with those which are available to replace them

concerns which are not able to produce high grade equipment will not be acceptable in a future emergency by reason of the extreme accuracy now required in munitions production. It is appreciated, of course, that this was a necessity to supply the tremendous demand, but the conditions which caused it must be avoided.

A Suggested Solution

It is now in order to suggest a solution to the equipment problem, attempting to combine present needs, future probabilities and reasonable financial outlay. Many of the proposals are neither new nor original and yet most of them are sufficiently vital to national defense and to governmental economy to permit repetition. Several of the preliminary steps indicated here have been undertaken, but this fact only emphasizes the need for a definite, comprehensive and adequate policy.

A review of equipment requirements shows the principal needs to be:

(a) Adequate modern machines for efficient current production.
(b) Improvement in the quantity and condition of reserve equipment based on emergency programs.

The recent procurement of machine tools has shown the value of modernization and the advantages of continuing the procurement so that the desired results can be complete and effectively maintained. The nature and extent of the reserve problem, and the changes which result from current modernization offer greater difficulties, such as:

(a) Large amount of funds involved.
(b) Major process changes requiring considerable equipment changes.
(c) Probability of industry meeting emergency machine tool load.

The establishment of a reequipment policy will require a definite grouping of equipment on a utility basis and the keeping of complete service records on each piece of equipment. Three main classifications will serve, namely: Current Service—including all items required for normal use; Reserve—including similar but slightly older items of occasional use or to provide for fluctuating production in peacetime; and Emergency—comprising the balance of serviceable equipment needed to permit the establishment to meet its wartime program.

Current service tools should be replaced at a rate that will keep the entire group abreast of the latest developments in industry and maintain the average age of all items at not more than five years. Reserve equipment (except for the type of items previously noted as essential and relatively free from obsolescence) should contain units transferred from the first group and should be retired after ten years of service. The advantage of this subdivision of equipment for normal use is that a more rapid replacement schedule can be planned for the more active equipment and a definite time of service (barring obsolescence) can be placed on all items without increasing the average age for the entire group.

Since the need for emergency equipment arises from the arsenal's wartime mission, it follows that all items so classified should have a place in the expanded program and be able to fill that place. Consequently, stand-by equipment must be serviced at sufficiently frequent intervals to preserve it, and, in justice to the machines which have a place to fill, those which do not should be eliminated. (This work is now under way). An ideal maintenance procedure calls for periodic operation of equipment to prove that it still functions, to change the contact positions of gears and bearings, and to replenish lubricant, but the actual cost of such a program would be prohibitive.

The economic value of retaining any equipment in a standby status depends on the useful life and accuracy remaining in it when it is placed in that status. Economically, therefore, if the cost of its maintenance over, say, fifteen years, exceeds its probable replacement cost, it should be disposed of, especially if it seems probable that it will not be equal to the future production demands. Against the economic factor, however, must be placed the replaceability factor. In other words, how soon could a new machine be obtained when and if needed?

The three emergency considerations —maintenance, usefulness, and replacement—suggest a program of overhaul or rebuilding, applicable to standby equipment only. Many machines in this category are too expensive to replace for limited use, or else are sufficiently good, basically, to warrant their retention. Most of them could be rebuilt, modernized or overhauled at a fraction of the replacement cost, which would be, in effect, servicing; the job itself could be timed to provide employment when most needed, and the result would be one more suitable tool on hand and one less to be procured—at a fraction of the cost of the procurement.

In conclusion, it will be noted that most of the problems of modernizing an arsenal have their counterparts in industry. An attempt has been made to convey the impression that the effects of modernization—efficiency and economy—are also comparable. Industrial economies result in greater profits, while governmental economies result either in greater output for the same expenditure, or the same output at less expense. Any accomplishment that is worth while must be paid for but a thing of inferior worth is too costly at any price. National defense is admittedly of value. The advantages of the investment necessary to increase its effectiveness should be obvious.

Summarizing the arsenal's machine tool requirements, they may be said to consist of: First, sufficient new equipment to provide, for the entire normal operating capacity, those advantages and economies of modernization which have obviously resulted from the partial replacement already effected. Second, improvement of the effectiveness of emergency capacity by continuous replacement of current machines with corresponding temporary retirement of those which are still serviceable, and by more extensive maintenance of stand-by facilities

Editorials

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K. H. CONDIT • F. H. COLVIN
EDITORS

LATE SPRING FROST

ALTHOUGH most of us had become pretty thoroughly hardened to wintry blasts during the past two months, the President's proposed tax on corporation surpluses came as a chilling shock. It was particularly tough after a few days of thawing weather, that promised to loosen up buying as well as the highways, to have a late frost come along and threaten to nip our budding heavy industry revival. For that is exactly the effect the surplus tax is likely to have.

This corporation tax is definitely intended to cramp the style of the big organizations which are so objectionable to Mr. Roosevelt. It is also pretty certain to prevent the growth of others from such small beginnings as Henry Ford's.

The President does not believe in plowing back earnings into a business to such an extent that it will grow powerful. He seems to be much more intent on having every available nickel distributed to stockholders so that it can be squeezed through the income tax wringer. He told a press conference that he was not interested in having large surpluses accumulated so that regular dividends could be paid in dull times. He specifically excepted reserves for depreciation and working capital from taxable surplus, however.

Because so many readers of *American Machinist* are engaged in making production machinery, the effect of this tax proposal on replacement and expansion programs is of vital interest. The President evidently believes that the reserves he mentions will take care of replacement but he seems to forget that many of these reserves were exhausted in the struggle for bare existence during the depression. Obviously, therefore, replacements will have to be made out of profits. If profits are subject to a twenty to forty per cent tax they will not go far as replacement funds, and the temptation will be for directors to postpone expenditures and avoid the tax by distributing dividends.

Those corporations that have them unless the law is made retroactive. The freezing process will congeal these surpluses and bids fair to solidify the surpluses and bids fair to solidify the existing business structure. In other words the big corporations will remain big and the little ones will have no chance to grow. The closely held corporations of moderate size will be hit hardest because their owners will either have to pay the big tax on surplus or else distribute it and pay high surtaxes.

THE proposal is not through Congress yet but it seems likely to appeal powerfully to members up for reelection who are piously hopeful that they can avoid voting for a higher income tax. There is but one way to counteract a frost and that is by applying heat. Better put some on your Congressmen before they get too chilly.

Wider Standards

STANDARDIZERS in Germany want to get international standards for certain parts and functions of machine tools—in the interest of the user, of course. They have asked the International Standards Association to appoint a committee to undertake the job.

What they would like to see is a standardization of machine speeds and feeds, of toolholding elements and of methods of testing accuracy of performance. They would like to have a standard series of speeds (based on the ISA preferred number geometric series), a decision on whether these are free or loaded speeds, and standardized rates of step-up of the speed and feed series.

Machine tapers and milling machine spindle noses are already being studied by ISA Committee 29. The Germans want to see the study extended to include toolholding elements of turret lathes and automatic screw machines.

Finally, the point is made that there is no uniformity in the method of determining whether a machine is as accurate as it should be, or as it is claimed to be.

Whether this proposal ever gets anywhere or not, it is a healthy sign that at least a few of the most nationalistic people in the world have time for an occasional international thought.

Chips

WASHINGTON — President proposes tax plan to wipe out corporation surpluses . . . General Hagood's uncomplimentary remarks about WPA relief bring his relief from command and a storm of debate in Congress and elsewhere . . . Roper fires two Commerce officials in row over marine safety measures . . . Senator Holt of West Virginia bares corruption in work relief in his state in angry speech before the Senate . . . Roosevelt vetoes $50,000,000 seed loan bill but "tempers the wind" by promising that needy farmers will get seed loans from relief agencies . . . Department of Justice report clears air mail carriers . . . I.C.C. orders passenger fares cut to two cents in coaches, three cents in Pullmans . . . Roosevelt signs AAA substitute . . . Modified Walsh Bill putting labor restrictions on government contractors is introduced . . . Hopkins reports 24,000,000 are getting relief of some kind through federal or other projects, orders WPA cut to 3,000,000 July 1 . . . Impression grows that Black Committee, FCC and SEC are being used to harass New Deal opponents.

FOREIGN—Loss of national election in Japan, followed by assassination of high government officials, stirs forebodings all over the world; premier escapes as brother-in-law impersonates him and is killed . . . Nazi officer announces that German army is now so strong that no country can interfere in German affairs . . . Hitler declines invitation to join in Mussolini's 5-power alliance . . . Dispatches Reich Army to occupy the Rhineland . . . French Chamber of Deputies ratifies defense treaty with Russia . . . Stalin says he is ready to fight Japan . . . Great Britain plans defense on basis of war in 4 years instead of 10, previous policy . . . Italians claim major victory in Ethiopia, Rome suggests peace overtures . . . League offers Mussolini choice between oil sanctions and peace acceptable to Selassie . . . Reich accepts offer of new naval agreement with Great Britain . . . Average annual Soviet wage in 1935 rose to 2,771 rubles, about $100 in buying power . . . Italian banks are nationalized by Mussolini . . . German army and police to eat fish twice a week in meat shortage.

FINANCE—Landis offers bill extending restrictions to cover over-the-counter securities . . . Bethlehem stockholders vote to merge separate corporation units into one Delaware operating corporation . . . Morgenthau announces Treasury refinancing program of $1,250,000,000 which is oversubscribed in one day . . . Tax moves in Congress arouse Economy League and National Chamber to demand retrenchment . . . Treasury will buy new Canadian silver through central bank.

INDUSTRY—Labor Board faces tough job in deciding between industrial and craft unions in Kentucky tobacco case . . . January railroad revenues best in five years . . . Court terminates receivership of Willys-Overland, reorganization under way .. . . Jones & Laughlin attorneys dispute jurisdiction of Labor Board and withdraw from hearing . . . Pennsylvania's Altoona shops complete big streamlined steam locomotive . . . Striking crew of Panama Pacific liner may be tried as mutineers.

TRADE—French tariff committee recommends reduction of 17 to 25 per cent in import duty on duplicating and tabulating machines . . . U. S. exports gained 7 per cent in 1935; imports up 24 per cent.

INDICATORS—Steel production rises moderately . . . Electric power output declines but is well above 1935 level . . . *Business Week's* index drops more than a point to 68.5 . . . Retail trade shows good gain.

Watching Washington

Soak-the-surplus tax good politics but poor economics . . . Business grows weary of Senate Committee "trials" . . . Berry works in the dark to hatch an old egg . . . Walsh bill revision introduced

WASHINGTON—Whatever may be said for or against the President's tax proposal, one thing is sure—it embodies the New Deal philosophy. It holds the spirit of spending rather than the thought of thrift; the get-the-money-circulating idea of the new economy rather than the provide-for-a-rainy-day tradition of our forebears. For in the bright horizons of New Dealdom, its prophets see a rainless day, except for a beneficent paper shower from a paternal government.

On the face of it the soak-the-surplus plan is additional proof of the President's political acumen. The wealthy are already being taxed to the point of diminishing returns; the poor are paying sales taxes, indirect levies and other tolls that are passed along to the consumer. The great middle class, in a better position to pay than any other group, is also in a better position to exert political influence. So the proposal would shun politically unpopular propositions by forcing earnings out of the hands of corporations into tax-paying dividend channels.

With no bill offered and no official interpretation available, there is a difference of opinion as to the effect of the suggested measure on equipment purchases. No doubt the tendency would be to freeze surpluses accumulated prior to January 1 which, according to the plan, would be exempt. Another result would be to discourage any plant additions from current earnings. Normal replacement could be financed from reserves, which do not appear as profit, but anything additional would either bear the high undistributed earnings tax or have to be financed independently. So another practice prized in times past, the pay-as-you-go policy, would pay double—or go.

A by-product of the tax plan would be to drive a wedge between corporation managements and stockholders. With a wedge already well started between employers and labor, it would seem that no more wedges were needed. But then stockholders are voters; any move that would wean them away from the belief they have something in common with corporate management is also good New Deal strategy.

Still another result of the tax plan would be to put a brake on bigness—also an administration project. Small wonder that the President is well pleased with a proposal that coats the bitter pill of taxation with the sugar of social reform.

One question comes to mind. How would American business and American workers have weathered the late depression were there no "excess" surpluses to call upon for wages and for dividends when current earnings did not justify them? William J. Cameron, Henry Ford's radio spokesman, estimated that during the depression corporate surplus distribution was $27,000,000,000 as against $5,500,000,000 spent on relief by the government.

Snooping on the Hill

The action of Senator Black's lobby investigating committee in subpoenaing telegraphic files of a large number of companies and individuals drew fire in Congress and led to a court move to enjoin the action. All of which aroused senatorial ire and provoked a "warning" by Black to curb court powers should any Federal judge dare to issue an injunction against the Senate committee.

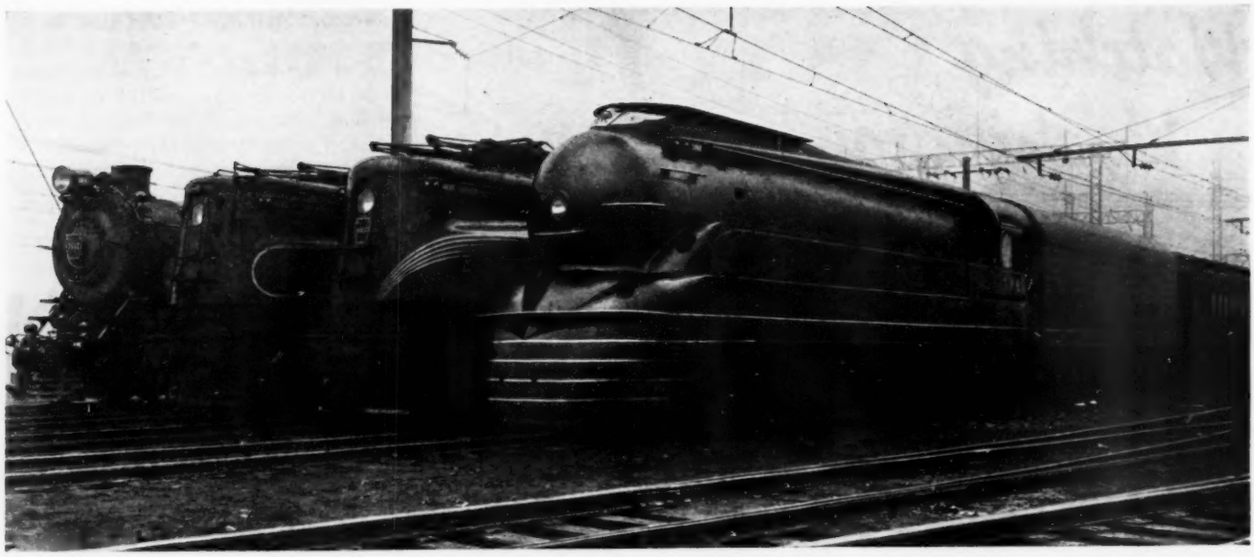
Beneath the exhaust steam lies the basic question of how far a Congressional committee can go in sitting as judge and prosecutor without violating individual rights to a fair trial conducted according to established court procedure. For it is evident that these "investigations" go beyond the function of fact-finding; the witness often finds himself in the position of a defendant with private or business prestige and property at stake. Sometimes such probings uncover practices that cry for correction, but those they put on the "spot" are at least entitled to know whether they are facing a group of Congressional G-men or a star-chamber court and to be permitted to defend themselves accordingly.

Skeleton in the Closet

And speaking of star chambers, a new worker in this field is none other than an old acquaintance, Major George L. Berry, Coordinator for Industrial Recovery. His secret, it is feared, will prove to be something of an anticlimax, since it is another old acquaintance, a dead one at that, the NRA. Those unacquainted with the Major's tactics will wonder why such a well known spook should be kept in the closet. The truth is that there is a skeleton there, too, the Berry industrial council.

It will be remembered that when industry walked out of the first meeting, the Major, aided by A. F. of L. Head William Green, gathered the remnants together into committees (*AM*—Vol. 80, page 56c). Now these committees have reported and have made recommendations to return government control over industry. Maximum work week, general wage regulation, child labor elimination, labor representation, in fact the NRA bag of tricks with a few additions, are sponsored. The open secret is that the committees and council, which will meet in executive session on March 12, do not represent much of anything but the Major himself and a part of organized labor. The only objective of the underground activities would appear to be preservation of the fiction that industry is truly represented in any of these activities.

While it is improbable that the Berry council's legislative program will be acted upon at this session of Congress, there is danger to a large section of industry from another source. Regulation of wages and hours of labor on all contracts with the federal government, subject of the Walsh bill which passed the Senate last session and narrowly missed becoming a law, has been brought up anew. Representative Healey, of Massachusetts, chairman of a subcommittee which has been making a study of the subject, introduced a bill on March 2 to prevent labor gains under NRA from being "entirely wiped out."



Evolution of the "Iron Horse"—Left to right: Conventional steam locomotive, early electric locomotive, streamlined electric locomotive, and new Pennsylvania Railroad's streamlined steam locomotive for high-speed, through passenger service. The new locomotive was built at the Altoona, Pa., works of the company. At a mile per minute it shows a saving of about 300 hp. over the conventional type. Six 80-in. driving wheels are partially inclosed in the full-flowing streamlined sheath. The locomotive and tender, with a coupled length of 95 ft., appear to be a single unit. Long, sweeping planes deflect the smoke upward to clear the locomotive and train

Textile Machinery Sales In 1935, 17% Over 1934

The 1935 sale of textile machinery continued its comeback from the depths to which it descended during the depression, according to *Textile World's* annual survey of sales of textile machinery and accessories.

Dollar volume of sales in 1935 was 17 per cent greater than that of 1934, and 32 per cent above 1933. On the basis of the 1933 Census of Manufactures, this means that last year's sales of textile machinery, parts and attachments approximated $79,000,000 as against $67,000,000 in 1934, and $60,000,000 in 1933.

The 1935 volume was only 26 per cent below the 1929 level, and was the highest year since 1929. It was 90 per cent higher than the low mark in 1932.

Based on 1929 as 100, the following table of index numbers shows the trend from that year to date:

1929	100
1930	67
1931	57
1932	39
1933	56
1934	63
1935	74

In no other year since 1929, when *Textile World* started its annual survey, has there been such an overwhelmingly optimistic attitude revealed by sellers of textile machinery and supplies. Of those who expressed themselves on the 1936 outlook, 86 per cent anticipated improved sales. Where individuals expressed their optimism in terms of actual percentage increase expected, these averaged to something better than an 11 per cent improvement in dollar volume forecast for 1936.

Modernization was the central theme of most of the letters received; the importance of replacing worn-out or obsolete equipment if the individual manufacturers are to prosper was stressed.

British Machinery Trade Gains Last Half of 1935

Great Britain's machinery manufacturing industry is in a relatively strong position, according to the U. S. Department of Commerce. The government's measures to spur increased foreign trade, and its sponsoring of a program to scrap obsolete ships and encouraging the building of new tonnage with low loan rates, have made the second half of 1935 an unusually prosperous period in this field.

Many metal working plants have been built during the year.

The last half of the year showed the machine tool trade to be the most active, followed closely by the electrical equipment industry.

H. J. Carmichael Made Canadian G. M. Head

H. J. CARMICHAEL, president of the McKinnon Industries, Ltd., a General Motors parts and accessory manufacturing organization, St. Catherines, Ont., Canada, has been appointed general manager of General Motors of Canada, Ltd., Oshawa, Ont., to succeed H. A. BROWN, retiring.

J. B. Doan Is Chairman of American Tool Works

With a record of 50 years of association with the American Tool Works Co. and its predecessors, Lodge, Davis & Co., the Lodge & Davis Machine Tool Co., and the Davis & Egan Machine Tool Co., J. B. Doan has been elected chairman of the board of directors of the company. The 50-year period includes five years as proprietor of the Chicago store of the company from which Mr. Doan distributed the company products in the Northeast.

At the annual meeting of the company other officers were elected as follows: L. W. S. Alter, president and general manager; R. S. Alter, vice-president and foreign sales manager; J. C. Hussey, vice-president in charge of domestic sales; A. E. Robinson, works manager and assistant secretary; Henry Luers, secretary and treasurer.

Motors AND OTHER MATTERS

Thaws bring flood of car orders... Extra shifts spur parts output... April seen as motor production peak ... Watchful waiting will be costly if machine tool orders are delayed... Fast trains have wheel trouble

BURNHAM FINNEY
Western Editor

DETROIT—Motor car production has suddenly come out of the tailspin into which it went when zero weather descended on the country. Someone has said that the industry is so organized that it can turn around on a dime; the present situation demonstrates this fact. A few bright, balmy days have increased sales mightily and car manufacturers have been quick to guess what is coming and to prepare for it.

Three-and-four-day weeks are being superseded by five-day operations as dealers are buying new cars in anticipation of a spring sales killing. Dealers are so confident of the richness of the market during the next 90 days that they are taking cars in liberal volume without much factory sales effort.

Add Shifts

Plymouth is going to a five-day week. Ford is to add a day to its schedule during the week of March 8. Chevrolet built 94,000 cars and trucks in February, has 110,000 set up for March and tentatively is counting on 126,000 for April. Chances are that these figures will be revised upward as the month advances.

Rapid reversal of the production trend has unleashed a substantial batch of orders to parts and materials suppliers. Steel mills are shipping sheets and strip which were rolled last month but which have been held pending actual need. Some parts plants have returned to extra shifts.

No one is yet ready to say when the sales and production peak is coming this year. In 1934 and 1935 April was the top month and probably April will have that honor again this year, because preparations for fall introductions of new cars should prevent the peak from coming much later.

The edge will be taken off the materials and parts business this spring because almost all car manufacturers have built up sizable banks of major parts as a safeguard against possible strike interruptions and to provide adequate reserves for the spring rush. Chevrolet, for example, is understood to have 75,000 axles stored against future needs, and other companies have accumulated large stocks of cylinder blocks, connecting rods, crankshafts and sheet metal parts. This means that these supplies must be absorbed in production during the coming months, because there will be an inevitable clean-up of materials as the end of the model season draws near.

The cold-weather bludgeoning which the industry got last month didn't dent the optimism of sales executives. They still look through rose-colored glasses at the 1936 market, envisioning a five-million-car year.

While the public has its mind on spring gayety, most automotive executives have their thoughts riveted on October and November, when 1937 models will be coming off assembly lines. One gets the impression that car makers are less certain today than they were a month ago regarding plans for next year. Much of what they do will be determined by what their competitors do. This tendency to "wait out" the other fellow has often been responsible for costly manufacturing delays, and such delays may occur for 1937 unless companies get busy and place equipment orders. The machine tool industry no longer can turn itself upside down to make deliveries within two to three weeks after purchases are made.

There has been more talk about rear-engine possibilities. Two well-known companies are reported to be testing radial type motors for rear-engine jobs. There is scarcely an automobile maker which hasn't a rear-engine car in the experimental stage. Yet the best-informed automotive men continue to believe that no large-production company will put the engine in the rear next year. Tooling costs would be terrific and no one is sure that the public is ready for such a radical step. The logical move will be to streamline further front-engine cars, so that car buyers become accustomed to seeing such automobiles (like the Airflows and Zephyrs), and then a year later move the engine from the front to the rear.

Design Changes Mean Tools

Independent springing is destined to make sharp gains, if the automotive oracles are to be believed. It appears to be only a matter of time until knee action, which is now confined to front wheels, is extended to rear wheels.

Nineteen thirty-seven will see more engine changes than in several years. Two new six-cylinder motors are now in the making, one for a company which heretofore has been building eights and another for a manufacturer of a six which is seeking a better-performing engine. Chevrolet has already been reported as planning important motor changes, including a four-bearing instead of three-bearing crankshaft, although it will retain a six as against Ford's V-eight.

Graham has adopted as standard equipment "autothermic" aluminum pistons which incorporate a thermostat to control the temperature. This type of piston, now being placed on the market by the maker after three years of development work, can be fitted to much closer limits than any aluminum piston yet made. It results in an increase of 3 to 4 per cent in horsepower and a corresponding reduction in friction horsepower, and yields marked oil economies. Two prominent automobile companies are known to be experimenting with this piston.

More Overdrives Expected

Much wider use of overdrive transmissions is looked for next year, partly because the overdrive is said to solve some engine bearing problems. The reduction of motor speed accomplished at high driving speeds by employing the overdrive cuts down the load placed on bearings. One company is said to be trying out successfully a steel bearing lined with tin base babbitt for connecting rod and main bearings in engines equipped with overdrive transmissions. The belief is that the extra expense of the overdrive may be more than offset by the use of less expensive bearings.

One General Motors division is re-

ported putting lead-bronze bearings, similar to those for airplanes, into a limited number of cars. These bearings have been developed and are made by AC Spark Plug Co. Ford seems committed more than ever to cadmium-silver-copper bearings as standard equipment.

Welding will play an increasingly important part in automobile production next year, with Fisher Body apparently going over to all-steel bodies, or a near approach to them. Car makers haven't dropped the idea of using larger stampings as wider sheets become available. One company has experimented to the extent of building a quarter-size model of a body made out of two pieces of steel, one for each side, welded lengthwise of the car through the middle. One stamping consists of the left half of the body, including floor, side, roof, cowl and back panel, and the other stamping of the right half of the body. Such construction won't materialize in 1937, but 1938 may tell a different story.

1937 Tool Orders Slow

Briggs Mfg. Co. is reported to have bought several huge presses at an expenditure of about $220,000. Erection of the Fisher Body plant at Grand Rapids is not progressing so rapidly as expected, bad weather having impeded operations. Fisher is said to have let out some die work for next year; so has Chevrolet. In the main, however, very little tool and die business for 1937 has been placed.

Machine-tool inquiries, which should have been closed before now, have dragged along without purchases being made. None of this business has been lost; it is awaiting final decision by managements, which appear to be somewhat at sea regarding their 1937 course. Packard tentatively has allotted orders for a considerable number of machine tools for a new cylinder block line.

A company in the low-price market is understood to have plans to eliminate one of its two lines of cars in 1937 and stick to one series which will be considerably lower priced than its present de luxe line. This action would force competitors to do the same thing. Thus the industry may provide next year the spectacle of a free-for-all battle among the Big Three which will react to the benefit of the equipment industries, because pressure would be put by management on production executives to achieve lowest possible costs with tools of the latest design.

* * *

The new era in railroad transportation, whereby passenger train schedules have been speeded up to regain patronage, has brought some problems with it. Among the foremost is that of finding a new steel for wheels which will bear the terrific punishment of going 110 miles an hour and then be brought to a relatively quick stop by means of modern braking. The major task is to develop a steel which has sufficient tensile strength, yet is ductile enough to meet requirements. The only accident to a streamlined train, in which nobody was injured, was due to failure of one of the car wheels. This problem is so pressing that one locomotive builder has set up recently a metallurgical department to try to work out a solution. Incidentally, it is said that the streamlined, lightweight trains proved their worth during the last 60 days, when they plowed successfully through snow drifts in which heavier steam locomotives stalled. It is claimed that the Burlington Zephyrs kept closer to their schedules in their runs out of Chicago during the zero spells than any other passenger trains.

Die Design and Die Making

Look in the March 25 number for the first of a series of articles under this title by E. G. Marshall. As explained on page 236, die designers and die makers will both profit from his practical suggestions on dies for the various press operations

World Now Using More Diamonds in Metal Shops

World use of industrial diamonds for precision boring, turning and dressing wheels for grinding, doubled in 1935 as compared with 1934, J. K. Smit & Zonen, Amsterdam, Holland, reports. Throughout the year prices have shown a slight gain in the world market.

The exacting requirements of modern engineering and metal working operations, particularly in the automotive industries in the United States, Great Britain, Canada, Germany, and Italy, has stimulated the use of industrial diamonds. The diamond merchants point out that other industries are striving for greater precision in output which have in turn been an additional outlet for the gems.

The report points out that France's import duty on industrial diamonds has "imposed a handicap on the metal working industry" of that country, and France showed no increase in the use of diamonds as compared with the previous year.

The 1935 world use of diamonds for wheel dressing showed a 90 per cent gain over the 1934 total, the report showed.

Most U. S. Companies Have Safety Programs

Three out of every five companies in the United States have organized safety programs, a survey made by the National Industrial Conference Board shows. Of 2,452 manufacturing, mining, transportation, communication, wholesale and retail trade, finance and public utility establishments, 1,249 reported organized safety work.

Safety committees are functioning in 1,200 of these companies, and in 474 safety contests are carried on, the survey disclosed.

Organized safety work is less prevalent in smaller companies. Only 28 per cent of those companies employing less than 100 workers have safety programs; 55 per cent of companies employing from 100 to 1,000 have such activities; 75 per cent of companies reporting from 1,000 to 5,000 employees have safety programs; and 87 per cent of the companies employing more than 5,000 have organized safety work among employees.

Economics of Engineering Session at Stevens' Camp

Stevens Institute of Technology will be host to the Society for the Promotion of Engineering Education's summer session on economics of engineering at the Stevens Camp, Johnsonburg, N. J., during the week of June 28. Twenty-four sessions will be held.

Big Equipment Exhibit Planned by Foundrymen

Foundry equipment will be exhibited for five days during the Detroit, Mich., convention of the American Foundrymen's Association, with the cooperation of the Foundry Equipment Manufacturers' Association, Inc., 1213 West Third St., Cleveland, Ohio. The exhibits will be open daily from May 5 to 9 at Convention Hall, Detroit. Reports from the convention management indicate the largest exhibit of equipment ever staged.

Great Lakes Exposition Reports Demand for Space

Increase of floor space for the Great Lakes Exposition, Cleveland, Ohio, June 27 to Oct. 4, is being planned because of the demand for exhibition booths. Although the exposition will emphasize the industrial importance of the Great Lakes region, manufacturers and equipment makers in many inland Ohio cities, Chicago, Ill., Pittsburgh, Pa., New York, N. Y., and other manufacturing centers have made space reservations.

The exhibition will stretch for a mile along Cleveland's lake front, with the entrance located about two blocks from the heart of the city.

Packaging Machines Should be Flexible

Manufacturers of packaging machinery were advised to design their equipment simple and flexible enough to permit changes in size and shape of containers, by George R. Webber, head of the package development bureau of Standard Brands, Inc., food manufacturers. Mr. Webber was speaking on March 5 in New York at the packaging conference held under the auspices of the American Management Association, 330 West 42nd St.

House Corp. Buys Kelch Auto Heater

The House Engineering Corp., a division of the Houdaille-Hershey Corp., Chicago, Ill., has purchased the entire business, patents and other assets of the Kelch Heater Co., Detroit, Mich.

Manufacturing equipment of the Kelch plant has been moved to Buffalo, N. Y., and was installed in the Houde Engineering Corp. factory at 537 East Delavan Ave. The product is a hot air heater, manufactured largely for the replacement market.

Francis Hodgkinson Retires

Francis Hodgkinson, for 22 years in charge of steam turbine development and manufacture for the Westinghouse Electric & Mfg. Co., has retired from the company after 42 years with the company. In 1896 he joined the Westinghouse company after a number of years in development work with Sir Charles Parsons. In 1916 he was put in charge of all of the company's steam power apparatus work, and ten years later became consulting mechanical engineer of the company. His associates gave him a testimonial dinner upon his retirement in Philadelphia, Pa.

Midwest Power Program Emphasizes Transmission

"Power Transmission to Machinery" will be an important feature of the Midwest Power Engineering Conference, April 20 to 23, Chicago, Ill. G. C. Miller, president, Dodge Mfg. Co., will be chairman of the transmission session on April 23. "Modern Group Drives" will be the subject of a paper by W. R. Clendenning, of the Power-Transmission Council; "High Starting Torque and Overload Release Devices" will be explained by William Stainer, E. I. duPont de Nemours, Inc.; and "Direct Motor Drives for Machinery Application" will be discussed by F. E. Butterfield, Commonwealth Edison Co.

Alma Motor Co. Formed To Make Drive Units

Alma Motor Co., Alma, Mich., has been organized to take over the business of the Alma Mfg. Co., of that city, to continue the manufacture of four-wheel-drive units for converting trucks. William W. Schenck is the president of the new company.

Albra Castings Corp., Huntingdon, Ind., has been organized by Herman Voges, Jr., formerly president of Webster & Perks Tool Co., Springfield, Ohio, as president, Vincent W. Pacula, formerly with Studebaker Corp. and Campbell Wyant & Cannon Foundry Co. is vice-president.

United Engineering & Foundry Co., Pittsburgh, Pa., purchased the machinery manufacturing plant of Mackintosh-Hempill Co., Wooster, Ohio.

Industrial Review

• FEBRUARY'S VOLUME of domestic machine tool sales showed little drop from the January five-year high record. Most localities maintained the same high level of orders with a few feeling a slight slackening. New inquiries are plentiful, and some sales offices are having difficulty in keeping up with them. Deliveries are lengthening because of the continued demand. At present the metal-working industry is practically free from labor difficulties. Close attention is being given the Akron strike, however, to see what impetus it gives to the development of vertical unions.

• NEW ENGLAND BUSINESS held up well, with prospects good during March. New York had bigger volume in February than in January. Philadelphia is pleased with the way the current level is holding and with the number of new inquiries received.

• PITTSBURGH is feeling little change, but advance inquiries are active; there is evidence here that the heavy industries are coming into their own. High executives are coming to the conclusion, long ago reached by shop men and superintendents, that they must spend money on modernization.

• CLEVELAND plants are about twelve weeks behind on commitments and look for good business until June at least. Used machinery sold from the Toledo Willys-Overland plant, to satisfy claims, was well absorbed. Both domestic and foreign buying contribute to maintain Cincinnati at a point close to the recent high level.

• DETROIT tooling plants suffered the effect of bad weather, but several releases are expected in the next ten days. Supply sales have held up well.

• CHICAGO sales are well maintained with prospects bright for further improvement. One distributor reports a larger number of machines shipped to a larger number of customers than during any month last year, with volume over 100 per cent better than for February, 1935. In Indianapolis orders and inquiries continue at a fair level. St. Louis had a quiet February with sales falling below the January figure. However that final result was satisfactory particularly on small tools which are a better barometer in this territory than machine tool business.

Industrial Indexes Strong in January

Both the Industrial Machinery Index and the Index of Shop Supply Sales moved sharply upward in January. Indications are that they maintained their gains in February but figures are not as yet available to substantiate this opinion.

In presenting the Industrial Machinery Index this month, the well known general business index of *Business Week* has been plotted against it for comparative purposes. A glance at the graph will show at once how sharply the sales of industrial machinery fluctuate as compared with business in raw materials and with retail sales and financial transactions, which are included, of course, in the *Business Week* Index.

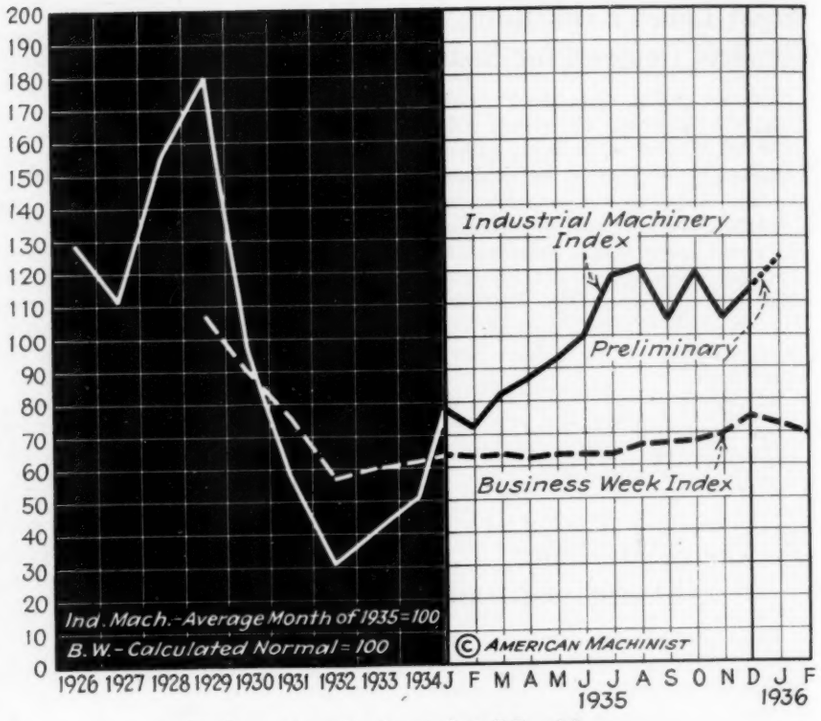
Although the *Business Week* figures go back only to 1929, that is far enough to bring out even more clearly the major fluctuations of the machinery curve which are evident in the month-by-month data of 1935 and 1936. The machinery index has been carried back to 1926 to add perspective to the current calculations.

The curve point used in the black section of the graph is the average monthly figure for each of the years indicated. In the white portion the curves connect actual monthly values.

Direct comparison of the actual figures of the two curves should be made with considerable discretion because there has been no attempt to reconcile the two bases. The *Business Week* Index depends on a computed normal index of 100 which is corrected for various economic factors. The Industrial Machinery Index, on the contrary, is based on the weighted average values of its seven factors during 1935 which is taken as 100.

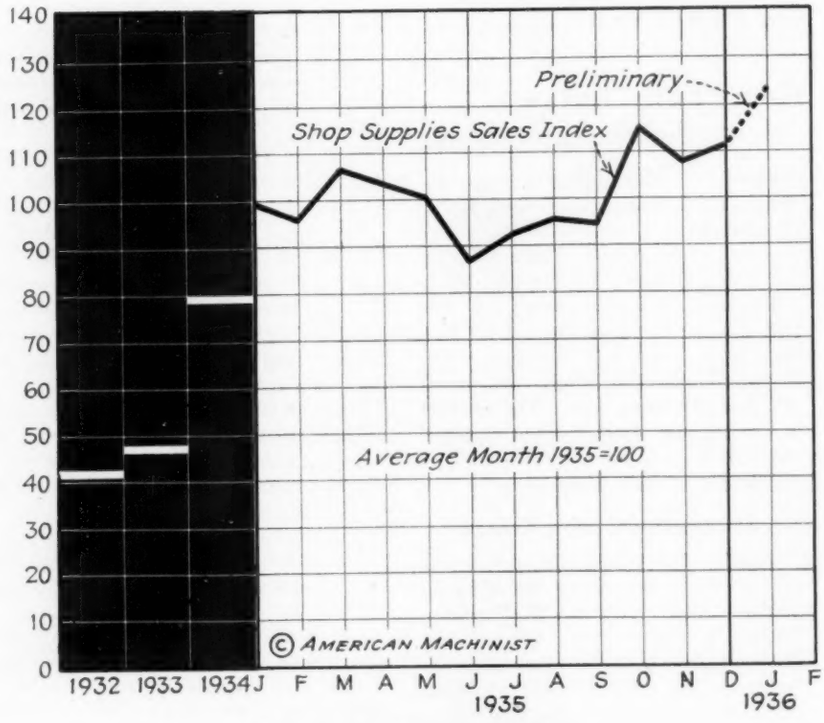
For January, the preliminary figure of shop supply sales has set a new high record for the history of this index which runs back only to 1932. Final figures for December are now available and show an improvement over the November index. As in the other curves the 1935 and 1936 monthly records are connected by the heavy line. In the black section, however, a bar is used to indicate the average monthly sales for the year. In the case of this curve also the fluctuating nature of the business as compared with the broader *Business Week* Index is evident.

The 1935 average monthly sales are taken as the base for this curve in order to make it directly comparable with the Industrial Machinery index.



Orders for Industrial Machinery

Final figures for December brought up the preliminary estimate a few points. January preliminary figure indicates further improvement



Sales of Shop Supplies

December's final figure is four points lower than the preliminary estimate but the January preliminary is up encouragingly

Willys-Overland Seeks to Lift Receivership

Willys-Overland Co., Toledo, Ohio, for the past three years in bankruptcy, has been granted an application in federal court for ending bankruptcy and reorganizing as a corporation. Directors of the company elected David R. Wilson, trustee, its president on Feb. 24 at Toledo, when they approved the plan for lifting the receivership. The plan will be submitted for approval to the court on April 1, under section 77-B of the Federal Bankruptcy Act, it is believed. Empire Securities, Inc., has obtained offers of the majority of bonds, it is understood. Ward M. Canaday, advertising agency president, is head of the securities company, which is said to have the backing of the Willys family and executors of the estate of the late John N. Willys, founder of the company.

Under the new setup, Mr. Wilson will have a free hand in making purchases and regulating output.

Japan's Machine Imports Show Gain During Year

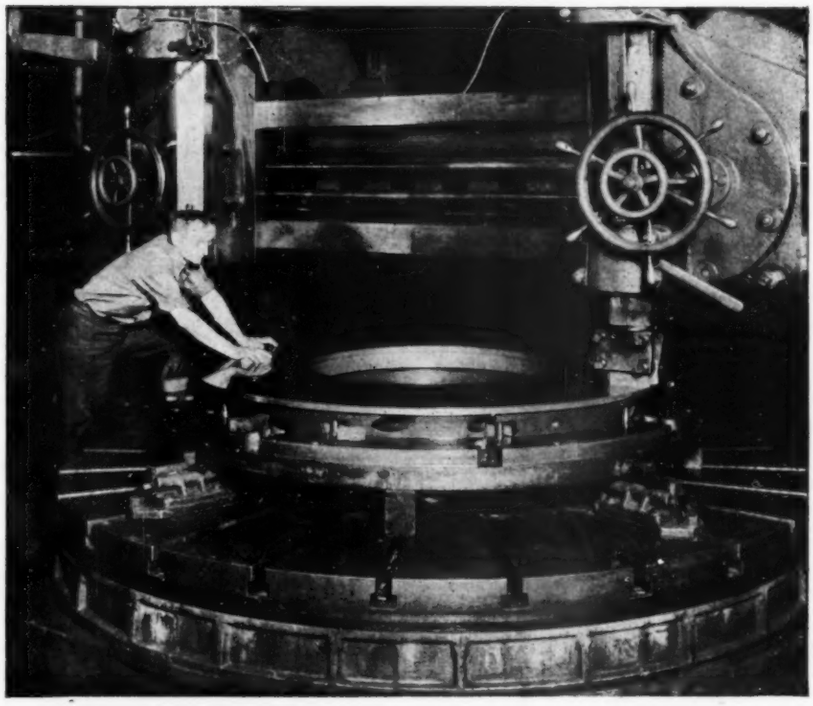
Japanese demand for foreign machinery continued at a high level during 1935, according to the U. S. Department of Commerce's Tokyo trade commissioner's office. Imports during the year showed an increase of 6 per cent over the 1934 total, and 44 per cent gain over the 1933 figure. Imports of machinery into Japan amounting to $29,467,920 were reported for 1935.

Domestic manufacture of machinery has shown notable gains during the year, with 83 companies manufacturing equipment items, continuing the upward trend in this field.

Women Workers Have Not Displaced Men

The increase in women workers during the past 50 years has not displaced men. Technological improvements have developed new types of work and increased the demand of labor, according to a study by the National Industrial Conference Board.

Between 1890 and 1930 the proportion of women workers in manufacturing and mechanical industries declined about 19 per cent. The gain in women workers has been in office work, trade, communication, and "service" industries.



***"Dead-Smooth"*—Ground and hand-lapped within 0.0005 in., this runner plate for a Kingsbury thrust bearing is being made for one of the new Norris Dam generators. The plate is 75 in. in diameter and 4½ in. thick, and is being hand-finished with special oil-stones in the East Pittsburgh Works of the Westinghouse Electric & Mfg. Co. A "dead-smooth" finish, without any scratches, is required to prevent wear**

Exports of Machinery During January, 1936

	January 1936	December 1935	January 1935
Electrical machinery and apparatus	$6,037,034	$6,046,744	$5,489,207
Power generating machinery (except automotive and electric)	937,519	716,418	617,406
Construction and conveying machinery	660,934	538,975	532,755
Mining, well and pumping machinery	2,668,095	2,723,948	2,178,156
Power-driven, metal working machinery	3,947,706	3,444,611	1,430,974
Other metal working machinery	729,901	318,954	166,878
Textile machinery	1,488,229	859,821	522,315

Exports of Metal-Working Machinery During January, 1936

	January 1936	December 1935	January 1935
Engine lathes	$291,299	$144,188	$32,054
Turret lathes	110,122	114,085	38,239
Other lathes	151,839	92,389	44,426
Vertical boring mills and chucking machines	139,865	246,166	27,832
Thread-cutting and automatic screw machines	191,721	222,360	42,997
Knee and column type milling machines	72,590	84,412	46,775
Other milling machines	251,517	321,819	75,554
Gear-cutting machines	330,432	161,203	70,909
Vertical drilling machines	58,883	20,144	65
Radial drilling machines	20,670	13,119	11,274
Other drilling machines	109,640	280,648	37,261
Planers and shapers	83,703	104,646	21,230
Surface grinding machines	115,214	214,109	52,095
External cylindrical grinding machines	176,886	147,069	62,807
Internal grinding machines	154,543	100,986	51,201
Tool grinding, cutter grinding, and universal grinding machines	194,202	112,033	65,524
Other metal grinding machines	67,908	81,795	34,008
Sheet and plate metal-working machines	111,825	160,094	151,453
Forging machinery	285,726	168,507	243,664
Rolling mill machinery	160,940	152,941	105,280
Foundry and molding equipment	556,093	167,751	27,080
Other power-driven metal-working machinery and parts	312,088	334,147	189,246
Other Metal-Working Machinery			
Pneumatic portable tools	51,346	54,793	50,805
Other portable and hand or foot operated metal-working machines and parts	51,001	51,851	57,562
Chucks for machine tools	12,661	13,073	7,898
Machine operated pipe and thread cutters, stocks, dies, taps and other machine-operated cutting tools	569,906	153,869	25,033
Other metal-working machine tools	44,987	45,368	25,580

PERSONALS

"Caterpillar" Factory Manager

M. ROGERS

M. Rogers has been appointed general factory manager of the Caterpillar Tractor Co., Peoria, Ill. He had been factory manager of the tractor division since 1929. Mr. Rogers became foreman of the turret lathe department of the C. L. Best Tractor Co., a predecessor of the Caterpillar Co. In 1927, two years after the formation of the present company, he was named assistant factory manager of the Peoria tractor plant.

James R. Munro succeeds Mr. Rogers as factory manager of the tractor division of the Caterpillar Tractor Co. Enrolling for the 4-year apprentice training course at the C. L. Best Tractor Co. in 1918, Mr. Munro was employed in the toolroom upon completion of this work. He became toolroom foreman in 1925, and was transferred to the San Leandro, Calif., factory, in charge of heat-treating. In 1931 he was sent to Peoria as superintendent of the company's diesel assembly line and assistant superintendent of tractor erection.

A. Edward Barit, first vice-president, general manager and treasurer, of Hudson Motor Car Co., Detroit, Mich., has been elected president of the company by the board of directors, to succeed the late Roy D. Chapin. As a young man of 20, Mr. Barit became an employee of the company when it was organized in 1909, by J. L. Hudson, Mr. Chapin and associates.

Stuart G. Baits was elected first vice-president and assistant general manager; W. R. Tracy, vice-president in charge of sales; I. B. Swegles, vice-president in charge of manufacturing; C. A. Oosdyke, vice-president in charge of purchases; A. Hood, treasurer; C. D. Sterling, secretary, and E. Cody, assistant secretary. H. M. Northrup, chief engineer, together with the above officers, were named directors.

Vincent Bendix, president of the Bendix Aviation Corp., South Bend, Ind., has been made a knight of the Legion of Honor of France for his promoting the social and economic relations of his employees in his Paris plant, and for his work in organizing a South Bend branch of the Alliance Française.

A. H. Renshaw, formerly vice-president of the General Railway Signal Co., New York, N. Y., has been elected president and chairman of the board to succeed the late W. W. Salmon. Sidney G. Johnson has been elected vice-president to succeed Mr. Renshaw.

Carl W. Bettcher has been elected vice-president of the Eastern Machine Screw Corp., New Haven, Conn. He has been connected with the company for seventeen years.

Clyde W. Blakeslee, president of the Machinery Club of Chicago, Ill., has appointed the following committee chairmen for the ensuing year; house, George Habicht; entertainment, F. L. Armstrong; sports, C. F. Sturgeon; and membership, A. W. Smith.

Comm. E. E. Wilson, has been named general manager of the Sikorsky Aviation Corp. factory at Stamford, Conn. He is senior vice-president of the United Aircraft Corp., of which the Sikorsky company is a subsidiary.

Elliot W. Stewart has been made vice-president in charge of engineering of the William D. Gibson Co., Clybourn Ave. and Willow St., Chicago, Ill. He has been sales manager of the company, manufacturer of springs and automotive parts.

T. I. Shriver, who has represented Henry Prentiss & Co., machinery dealers, New York, N. Y., in its Syracuse, N Y., office, has been elected president of the V. & O. Press Co., Hudson, N. Y. Mr. Shriver had been with Henry Prentiss & Co. since 1918.

Ansel A. Cooper has been appointed president and manager of the A. & C. Mfg. Co., manufacturer of testing devices for internal combustion engines, Philadelphia.

Harry L. Shaw, Lorain, Ohio, has been appointed general manager of the Keystone Driller Co., Beaver Falls, Pa.

Heads Tractor Plant

JAMES R. MUNRO

Eugene C. Clarke and Robert E. W. Harrison announce the formation of a management and engineering firm, Clarke-Harrison, Inc., with offices in suite 1818, Packard Building, Philadelphia.

Mr. Clarke is president of the Chambersburg Engineering Co., Chambersburg, Pa., a director of the National Machine Tool Builders' Association, and on several committees of the Machinery & Allied Products Institute. Mr. Harrison is vice president of the Chambersburg Engineering Co. He was formerly chief engineer of Cincinnati Grinders, Inc., and later chief of the Machinery and Agricultural Implement Division, Bureau of Foreign and Domestic Commerce, Department of Commerce. He has been active in local section and standards work of the American Society of Mechanical Engineers.

Glenn G. Kohlbacher has resigned as treasurer and general manager of the Jamestown Metal Products, Inc., to become vice-president and general manager of the Davis Furniture Co., and the Randolph Furniture Works, Jamestown, N. Y.

R. R. Cooley has been appointed production manager of the Cooley Electric Furnace Co., Indianapolis, Ind.

J. O. Lange has been appointed engineer of patents of the Crane Co., Chicago, Ill.

J. D. Wright and Karl H. Runkle have been appointed assistant managers of the industrial department of General Electric Co., Schenectady, N. Y., J. E. N. Hume, manager of the department, announced.

STEPHEN F. BRIGGS, chairman of Briggs & Stratton Corp., 2711 No. 13th St., Milwaukee, Wis., has acquired the controlling interest of the Johnson Motor Co., outboard engine manufacturer, and has been elected president of the company, succeeding H. G. DELABAR. Officers of the Johnson company are JOSEPH RAYNIAK, vice-president in charge of manufacturing; P. A. TANNER, vice-president and manager of domestic sales; E. H. MILLET, vice-president in charge of exports and the refrigerator division; and C. P. ROSSBERG, secretary and treasurer. Beside these officers, members of the board include JOSEPH OTIS, president of Stewart-Warner Corp.; EUGENE F. McDONALD, president of Zenith Radio Corp., both of Chicago, Ill.; and T. S. MURPHY, Hayden, Stone & Co., New York, N. Y.

HARRY SAVILLE, Pittsburgh, Pa., has been appointed general manager of the Mullins Boat Corp., Oil City, Pa., recently organized to take over the metal boat building division of the Mullins Mfg. Co., Salem, Ohio.

OBITUARIES

GEORGE B. ALVORD, a director of the Torrington Co., Union Hardware Co., Progressive Mfg. Co., and other Torrington, Conn., interests, and Magma Copper Co., New York, N. Y., died March 1 at Nassau, B. W. I.

W. C. DUYCKINCK, who as early as 1875 was one of the largest dealers in machinery, and railroad and mill supplies in New York, died on Feb. 21 in Plainfield, N. J., at the age of 92. He was one of the oldest graduates of Yale University, and was secretary of his class, 1865, for nearly 60 years. He retired from the machinery business to go into insurance. He retired 25 years ago.

CHESTER W. FELL, secretary of the W. A. Chase & Son Mfg. Co., 31 Main St., Buffalo, N. Y., died on Feb. 15.

JAMES FITZGERALD, one of the founders of the Fanner Mfg. Co., Cleveland, Ohio, manufacturers of metal products, died at the age of 71 on Feb. 26. He had been connected with the company for 40 years.

HERMAN FORG, 82, president & treasurer of the Peter Forg Mfg. Co., Somerville, Mass., hardware manufacturers, died Feb. 24. He began as a wood carver and with his father in 1887 organized the hardware manufactory.

THOMAS A. HOLLINDRAKE, president of A. R. Williams Co., Ltd., Toronto, Ont., Canada, machinery and machine-tool manufacturers, died Feb. 16 at the age of 68.

JOHN KENNEDY, president of the Hunter Saw & Machine Co., 5644 Butler St., Pittsburgh, Pa., died on Feb. 20. He was 73.

GEORGE H. LETZ, president of the Letz Mfg. Co., Crown Point, Ind., manufacturer of farm implements, died in Chicago on Feb. 25 at the age of 50. For the past three years he was treasurer of Valparaiso University, Valparaiso, Ind. The company was established by his father, LOUIS H. LETZ.

J. G. MATTHEWS, president, Berea Machine & Tool Works, Berea, Ohio, who founded the company in 1920, died on Feb. 25 at the age of 71. He had been connected with the Cleveland Twist Drill Co., and had taught mechanics and mechanical drawing in Cleveland for 12 years.

GEORGE A. MIDWOOD, JR., 39, treasurer of the Bicknell Thomas Co., Greenfield, Mass., makers of tapping machinery and counterbores, died Feb. 18. He served as an aviator in the World War, and had been connected with Bicknell Thomas since 1929.

SAMUEL SCHWARTZ, president Schwartz Mfg. Co., Two Rivers, Wis., buffing and polishing wheel manufacturers, died in Miami, Fla., at the age of 70.

TALBOT G. SHIPLEY, 62, general manager of the American Car & Foundry Co., St. Louis, Mo., plant, died on Feb. 21. For 47 years he had been an employee and executive of the company.

DAWSON H. SKEEN, president, D. H. Skeen & Co., Chicago, equipment sales engineers, and formerly assistant to the president of Edward Valve & Mfg. Co., Inc., East Chicago, Ind., died Feb. 23 at the age of 48.

JOSEPH STAUFFER, pioneer metal manufacturer and vice-president of the Galt Art Metal Co., Galt, Ont., Canada, died on Feb. 18 at 82.

FRANK HALL TUTHILL, president of the Tuthill Spring Co., Chicago, Ill., died on Feb. 24. With his brother, WILLIAM TUTHILL, he organized the company in 1880, and served continuously as president for 56 years.

GEORGE W. WILMOT, 67, president of the Wilmot Engineering Co., Hazleton, Pa., died recently at his home following a brief illness.

RALPH G. WRIGHT, one of the owners of the Reed Mfg. Co., manufacturer of plumbing supplies and equipment, Erie, Pa., died recently.

BUSINESS ITEMS

A. D. BROWN has been appointed manager of the Los Angeles, Calif., district office of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., to succeed the late BOYD ANDERSON. Mr. Brown had been manager of the company's Buffalo, N. Y. office. H. E. WEISS will be in charge of the Buffalo office.

Binghamton Flexible Shaft Co., Johnson City, N. Y., is again operating after suffering the loss of its entire factory by fire.

Mathews Conveyor Co., Ellwood City, Pa., has received the official award of merit of the Rice Leaders of the World Association, "for high character and worth-while achievement."

R. S. BROWN has been appointed Eastern sales representative for National Automatic Tool Co., Richmond, Ind., for its line of "NATCO" drilling, boring and tapping machines and equipment, with offices in New York, N. Y.

C. H. BRIGGS has joined the Syracuse, N. Y., office of Henry Prentiss & Co., 405 Lexington Ave., New York, N. Y., prominent machinery dealers.

American Management Association's headquarters have been moved from 20 Vesey St., New York, N. Y., to 330 West 42nd St., the McGraw-Hill Bldg.

MEETINGS

AMERICAN GEAR MANUFACTURERS ASSOCIATION. Annual Convention, April 20-21, Adelphia Hotel, Philadelphia, Pa. J. C. McQUISTON, manager-secretary.

MIDWEST POWER ENGINEERING CONFERENCE & MIDWEST ENGINEERING & POWER EXPOSITION. April 20-24. Palmer House and International Amphitheatre, Chicago, Ill. G. E. PFISTERER, manager, 308 West Washington St., Chicago, Ill.

NATIONAL OIL BURNER SHOW. April 14-18. Convention Hall, Detroit. G. HARVEY PORTER, managing director, Oil Burner Institute, Inc., 30 Rockefeller Plaza, New York, N. Y.

SOCIETY OF AUTOMOTIVE ENGINEERS. Tractor & Industrial Power Meeting, April 15-16, Milwaukee, Wis.; National Production Meeting, April 21-24, Detroit, Mich.; Summer Meeting, May 31-June 6, White Sulphur Springs, W. Va. JOHN A. C. WARNER, secretary, 29 W. 39th St., New York, N. Y.

Corporation Reports

Company	1935 Earnings	1934 Earnings
Adams (J. D.) Mfg. Co.	$398,459	$279,014
Air-Way Electric Appliance Corp.	d230,096	d420,667
American Hardware Corp.	101,130	d244,364
American Machine & Metals, Inc.	181,348	28,042
American Safety Razor Corp.	1,271,008	1,065,234
American Thermos Bottle Co.	209,613	177,687
American Transformer Co.	15,631	d4,146
Apex Electrical Mfg. Co.	198,439	11,530
Arrow-Hart & Hegeman Electric Co.	643,555	254,928
Babcock & Wilcox Co.	522,888	d1,293,329
Bellanca Aircraft Corp.	d194,221	.....
Bridgeport Machine Co.	139,871	221,907
Briggs & Stratton Corp.	1,063,324	540,498
Bucyrus-Erie Co.	156,429	d289,036
Bucyrus-Monighan Co.	201,545	63,241
Cassco Corp.	7,444	17,963
Chicago Flexible Shaft Co.	732,535	368,040
Chicago Rivet & Machine Co.	232,624	98,198
Cleveland Welding Corp.	d79,058	28,068
Crane Co.	1,147,651	1,201,543
Cutler-Hammer, Inc.	603,386	66,464
Detroit Gasket & Mfg. Co.	463,151	86,838
Detroit Steel Products Co.	310,774	152,257
Eaton Mfg. Co.	1,838,489	988,711
Electric Auto-Lite Co. (& subsidiaries)	2,908,797	1,212,135
Electric Controller & Mfg. Co.	324,926	178,786
Evans Products Co.	329,502	1,323,840
Ex-Cell-O Aircraft & Tool Corp.	329,165	140,301
Fedders Mfg. Co.	234,413	88,503
Federal Screw Works	d122,614	d28,957
Foote-Burt Co.	70,024	d109,905
Gardner-Denver Co.	717,403	340,329
Gemmer Mfg. Co.	220,214	d13,047
General Bronze Corp.	80,336	d460,239
Gillette Safety Razor Co.	4,568,805	4,229,001
Geometric Stamping Co.	51,533	d147,580
Greendale Products Co.	d19,500	d21,144
Holland Furnace Co. (9 mos. ended Dec. 31)	$915,508	a$437,178
Hudson Motor Car Co.	584,749	d3,239,201
Indian Motorcycle Co.	d13,939	.....
Intertype Corp.	244,470	124,228
Landers, Frary & Clark	584,029	514,165
Lima Locomotive Works, Inc.	d538,707	d490,826
Lockheed Aircraft Corp.	217,986	d190,891
Ludlow Typograph Co.	158,659	102,555
Mack Trucks, Inc.	d395,616	17,138
Marion Steam Shovel Co.	d157,540	d215,287
Marlin-Rockwell Corp. (of Del.)	1,112,186	538,258
McCord Radiator & Mfg. Co.	250,680	d27,509
Mesta Machine Co.	3,114,527	1,517,249
Meteor Motor Car Co.	13,884	d9,779
Meyer-Blanke Co.	61,994	73,766
Motor Wheel Corp.	1,087,979	409,673
Muskegon Motor Specialties Co.	55,535	107,716
National Acme Co.	257,408	140,329
National Tool Co.	55,092	.....
Package Machinery Co.	27,204	35,765
Perkins Machine & Gear Co.	76,208	21,129
Pitney-Bowes Postage Meter Co.	427,833	301,835
Remington-Rand, Inc. (10 mos. ended Jan. 31)	2,235,000	1,144,000
Reynolds Metals Co.	1,419,267	1,642,461
Reynolds Spring Co.	394,838	150,637
Seagrave Corp. (quarter ended Jan. 31)	d525	d90,727
Servel, Inc.	288,624	d215,202
Stanley Works	1,377,770	561,449
Sullivan Machinery Co.	d80,102	d355,761
Thew Shovel Co.	151,000	.....
United Aircraft Corp.	434,635	1,051,058
Victor Equipment Co.	72,679	32,170
Wagner Electric Co.	835,947	314,330
Watson (John Warren) Co. (six mos. ended Jan. 31)	d112,306	d302,385
Waukesha Motor Co.	153,628	.....
Worthington Pump & Machinery Corp.	d95,387	d1,083,197
Harnischfeger Corp.	d83,260	d530,416
Yellow Truck & Coach Mfg. Co.	503,000	d886,468

EXPORT OPPORTUNITIES

Cigar-making machinery and equipment. (Purchase). Winnipeg, Canada. *281.

Embossed-label machinery. (Purchase). Paris, France. *267.

Steel-drum machinery, 60 gal. capacity. (Purchase). Harbin, Manchuria. *276.

Grain milling machinery. (Agency). The Hague, Netherlands. *280.

Paper-straws making machines. (Purchase). Jaffa, Palestine. *268.

Air-conditioning equipment. (Agency). Riga, Latvia. *322.

Air-conditioning equipment. (Agency). Winnipeg, Canada. *284.

Cork-slicing machines; band or circular. (Purchase). Prague, Czechoslovakia. *301.

*Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington or any district or cooperative office.

PATENTS

February 25, 1936

Metal-Working Machinery

Sheet Metal Cutter and Edger. James J. Ingels, Chicago, Ill., assigned to Enoch Purnell and Henry G. Goelitz. Patent 2,031,604.

Self Contained Grinding Wheel Head. Gardner S. Gould, Lunenburg, Mass. Patent 2,032,011.

Long Stock Fabricating Machine. Joseph H. Roberts, Waterbury, Conn., assigned to the F. B. Shuster Co. Patent 2,032,098.

Band Saw Guide. Herbert E. Tautz, Milwaukee, Wis., assigned to Delta Manufacturing Co. Patent 2,032,233.

Wire Feeding Apparatus. Verni J. Chapman, Schenectady, N. Y., assigned to General Electric Co. Patent 2,032,260.

Grinding Machinery. Sol Einstein, Clement Booth, and Frederick S. Haas, Cincinnati, Ohio, assigned to the Heald Machine Co. Patent 2,032,268.

Shears for Trimming Sheet Metal. Louis Frielinghaus, Dusseldorf, Germany, assigned to Schloemann Aktiengesellshaft. Patent 2,032,276.

Roller Closing Die Arrangement for Use in Stranding Machines. Reginald Edward Pritchard, Old Trafford, and Isaac James McAlpine, Urmston, England, assigned to W. T. Glover and Co., Ltd. Patent 2,032,308.

Tools and Attachments

Torch for Welding Seams Along Curving Surfaces. James L. Anderson, Closter, N. J., assigned to Air Reduction Co., Inc. Patent 2,031,583.

Fixture for Assembling Rubber Articulated Joints. John P. Tarbox, Philadelphia, Pa., assigned to Budd Wheel Co. Patent 2,031,797.

Thread Restoring Tool. Gustav A. Boettcher, Richmond Hill, N. Y. Patent 2,032,198.

Processes

Method of Making Bonded Rubber and Metal Articles. Roger K. Lee, Highland Park, and Willet J. McCortney, Royal Oak, Mich., assigned to Chrysler Corp. Patent 2,031,720.

Welded Articles and Process Therefor. Samuel A. Snell, Toledo, Ohio, assigned to the Bingham Stamping & Tool Co. Patent 2,031,863.

Process for Cleaning Metal Surfaces. Carl Johnson, East Orange, N. J., assigned to Oakite Products, Inc. Patent 2,032,174.

March 3, 1936

Metal-Working Machinery

Pantographic Reproducing Machine. Newton O. Burnett and Eugene Schmidt, Flushing, N. Y. Patent 2,032,350.

Work Gripping Mechanism. Henry C. Geist, Waynesboro, Pa. Patent 2,032,535.

Method of and Apparatus for Forming Screws. Birger W. Lindquist, Detroit, Mich. Patent 2,032 586.

Gear Lapping Machine. Ernest A. Overstedt, Detroit, Mich., assigned to Michigan Tool Co. Patent 2,032,589.

Automatic Lathe. Robert D. Shaw, Hartford, Conn., assigned to Pratt & Whitney Co. Patent 2,032,597.

Automatic Electrically Operated Lathe for Multiple Diameter Turning. Robert D. Shaw, Hartford, Conn., assigned to Pratt & Whitney Co. Patent 2,032,598.

Multiple Spindle Hobbing Machine. Frank H. Adams, Cleveland Heights, Ohio, assigned to the Cleveland Hobbing Machine Co. Patent 2,032,046.

Universal Cutting or Welding Machine. James L. Anderson, Closter, N. J., assigned to Air Reduction Co., Inc. Patent 2,032,733.

Tools and Attachments

Reseating and Rethreading Tool. Frank R. West, Detroit, Mich. Patent 2,032,384.

Abrasive Saw. Fred Bley, Chicago, Ill., assigned to Martin Hoerer, Chicago, Ill. Patent 2,032,395.

Segmental Grinding Wheel. George N. Jeppson, Worcester, Mass., assigned to Norton Co. Patent 2,032,484.

Grinding Machine. Harry W. Kulp and Martin C. Dellinger, Lancaster, Pa., assigned to K-D Manufacturing Co. Patent 2,032,538.

Surface Plate Device. Joseph Verderber, Cleveland, and Elmer F. Batterman, East Cleveland, O. Patent 2,032,728.

Comparator. Amos P. Steiner, Waynesboro, Pa., assigned to Landis Tool Co. Patent 2,032,856.

Processes

Method for Hardening Metals. Samuel E. Gertler, New York, N. Y., assigned to Harry L. Stein. Patent 2,032,694.

Process of Heating Steel for Hardening. Frederick Jarvis, Philadelphia, Pa. Patent 2,032,700.

Method of Coating Metal. Carl H. H. Fessler and George J. Puchta, Cleveland, O., assigned to the American Steel & Wire Co. Patent 2,032,744.

Method of and Mechanism for Forming Hardened Steel. Robert C. Angell, Prince Bay, N. Y., assigned to the S. S. White Dental Manufacturing Co. Patent 2,032,901.

Method of Coloring and Hardening Steel. Henry J. N. Voltmann, Brooklyn, N. Y., assigned to W. S. Rockwell Co. Patent 2,032,963.

American Machinist — REFERENCE BOOK SHEET ©

Chromium Steels (Sheet, Strip and Plate)

Part II

Explanation of Finish:

No. 1. For parts which require no further finishing—for oxidation or scale resistance.

No. 2D. Similar to No. 1, except slightly better finish due to cold rolling. For deep-drawn articles which are polished subsequent to fabrication.

No. 2B. Slightly harder temper than No. 1 and No. 2D, hence should not be used for exceptionally difficult deep-drawing work. This finish lends itself better to polishing than No. 1 or No. 2D.

No. 4. For use where a polished finish is demanded. It is used for such equipment as dairy and ice cream tanks, soda fountains, meat packing and food equipment, architectural and building construction, etc.

No. 6. Tampico brushing of the No. 4 finish results in a satin finish with lower reflectivity than No. 4 finish. For building construction and ornamentation where a brighter finish is undesirable—for use in conjunction with bright finish No. 4, No. 7 and No. 8 as contrasts.

No. 7. The buffing of No. 4 finish results in a sheet with a high degree of lustre, but in which all the grit lines are not removed. It is used for trim for cabinets — for a contrast with other finishes.

No. 8. The highest degree of polish commercially available. Grit lines and scratches have been removed. This finish is suitable for press plates as used in the laminated paper and fibrous products industry—for mirrors and reflectors.

Designation of Finish for Strip

14. The various types of finish procurable on strip products shall be:

(a) Cold-Rolled Strip:

No. 1 Finish—Annealed and pickled.

No. 2 Finish—Annealed, pickled and rerolled.

No. 3 Finish—Annealed, pickled, mechanically cleaned or buffed without the use of abrasives.

(b) Hot-Rolled Strip:

No. 1 Finish—Hot rolled, annealed and pickled.

Explanation of Finish:

No. 1. For parts requiring maximum amount of deep drawing, for oxidation resistance.

No. 2. Slightly harder temper than No. 1 or No. 3, finish due to extra cold rolling. Very good surface.

No. 3. For parts requiring medium amount of deep drawing, for rolling and molding operations. This strip has a bright surface and requires very little polishing to finish.

Designation of Finish for Plates

15. The various types of finish procurable on plates shall be as follows:

No. 1 Finish—Hot rolled, annealed and either pickled or sand blasted and pickled.

No. 4 Finish—Standard polish (limitation on width).

Sheet Tolerances

16. The material referred to as sheet

Table IV.—Thickness Tolerances of Cold-Rolled Strip

Thickness tolerances are based on measurements taken ½ in. in from the edge on cold-rolled strip 1 in. or over in width, and at any place on the strip on material less than 1 in. in width.
Tolerances given are in inches and all are plus or minus.

Ordered Thickness, in.	Width									
	Under ½ to 1/16 in., incl.	Under 1 to ½ in., incl.	Under 1½ to 1 in., incl.	Under 3 to 1½ in. incl.	3 to 6 in., incl.	Over 6 to 9 in., incl.	Over 9 to 12 in., incl.	Over 12 to 16 in., incl.	Over 16 to 20 in., incl.	20 to 23½ in., incl.
0.249 to 0.161, incl.	0.002	0.002	0.003	0.003	0.004	0.004	0.004	0.005	0.006	0.006
0.160 to 0.100, incl.	0.002	0.002	0.002	0.002	0.003	0.004	0.004	0.004	0.005	0.005
0.099 to 0.069, incl.	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.004	0.004	0.004
0.068 to 0.050, incl.	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.004	0.004
0.049 to 0.040, incl.	0.002	0.002	0.002	0.002	0.0025	0.003	0.003	0.003	0.004	0.004
0.039 to 0.035, incl.	0.002	0.002	0.002	0.002	0.0025	0.003	0.003	0.003	0.003	0.003
0.034 to 0.032, incl.	0.0015	0.0015	0.0015	0.0015	0.002	0.0025	0.0025	0.0025	0.003	0.003
0.031 to 0.029, incl.	0.0015	0.0015	0.0015	0.0015	0.002	0.0025	0.0025	0.0025	0.003	0.003
0.028 to 0.026, incl.	0.001	0.001	0.0015	0.0015	0.0015	0.002	0.002	0.002	0.0025	0.003
0.025 to 0.023, incl.	0.001	0.001	0.001	0.001	0.0015	0.002	0.002	0.002	0.0025	0.0025
0.022 to 0.020, incl.	0.001	0.001	0.001	0.001	0.0015	0.002	0.002	0.002	0.0025	0.0025
0.019 to 0.017, incl.	0.001	0.001	0.001	0.001	0.001	0.0015	0.0015	0.002	0.002	0.002
0.016 to 0.015, incl.	0.001	0.001	0.001	0.001	0.001	0.0015	0.0015	0.0015	0.002	0.002
0.014 to 0.013, incl.	0.001	0.001	0.001	0.001	0.001	0.0015	0.0015	0.0015	0.002	0.002
0.012	0.001	0.001	0.001	0.001	0.001	0.001	0.0015	0.0015	0.0015	0.0015
0.011	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0015	0.0015	0.0015
0.010	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0015	0.0015
0.009 to 0.006, incl.	0.00075	0.00075	0.00075	0.00075	0.00075	.....	.....	.....	.....	.....
Under 0.006	0.00050	0.00050	0.00050	0.00050	0.00050	.....	.....	.....	.....	.....

Table V.—Dimensional Tolerances of Cold-Rolled Strip

WIDTH TOLERANCES, NOS. 1, 5, AND 6 EDGES

Edge	Edge Description	Width, in.	Thickness, in.	Tolerance in Width plus or minus, in.
No. 1	Round or square edge, rolled	1/16 or under	1/16 or under	0.005
No. 1		Over 1/16 to ¼, incl.	1/16 or under	0.005
No. 1		Over ¼ to 5, incl.	¼ or under	0.005
No. 5	Square rolled or filed after slitting	1/16 or under	1/16 or under	0.005
No. 5		Over 1/16 to ¼, incl.	1/16 or under	0.005
No. 5		Over ¼ to 5, incl.	¼ or under	0.005
No. 5		Over 5 to 9, incl.	¼ to 0.008, incl.	0.010
No. 5		Over 9 to 20, incl.	0.105 to 0.015	0.010
No. 5		Over 20 to 23½, incl.	0.080 to 0.023	0.015
No. 6	Square edge, rolled	¼ or under	1/16 or under	0.010
No. 6		Over ¼ to 1½, incl.	1/16 to 0.025, incl.	1/64
No. 6		Over 1½ to 2, incl.	¼ to 0.025, incl.	1/32
No. 6		Over 2 to 6, incl.	¼ to 0.025, incl.	1/64

LENGTH TOLERANCES

Length, ft.	Tolerance, in.	Length, ft.	Tolerance, in.
Up to 5, incl.	+¼	Over 30 to 40, incl.	+1
Over 5 to 10, incl.	+½	Over 40 to 60, incl.	+1½
Over 10 to 20, incl.	+¾	Over 60 to 90, incl.	+2
Over 20 to 30, incl.	+1	Over 90 to 200, incl.	+2½

WIDTH TOLERANCES[a] Thickness, in.	Widths			
	Up to 2 in.	Over 2 to 6 in.	Over 6 to 12 in.	Over 12 to 24 in., excl.
0.050 or under	0.007	0.010	0.015	0.015
0.051 to 0.083	0.010	0.012	0.015	0.020
0.084 or over	0.015	0.015	0.018	0.020

CAMBER TOLERANCES[b]

Up to and including 1½ in. in width	½ in. in any 8-ft. length
Over 1½ to 24 in. excl., in width	¼ in. in any 8-ft. length

[a] Width tolerances shown are plus or minus. If variation is desired all one way, double the figure indicated.
[b] Camber shall be determined by placing an 8-ft. straight edge against the concave side of the strip.

Chromium Steels (Sheet, Strip and Plate)

shall conform to the dimensional and weight tolerances in Table III.

Strip Tolerances

17. *(a) Cold-Rolled Strip*—The material referred to as cold-rolled strip shall conform to the dimensional tolerances indicated in Tables IV and V.

(b) Hot-Rolled Strip—The material referred to as hot-rolled strip shall conform to the dimensional tolerances indicated in Table VI.

Plate Tolerances

18. The material referred to as plate shall conform to the thickness and weight tolerances in Table VII.

Finish

19. The material shall be free from injurious defects, shall have a workmanlike appearance, and shall correspond to the designated finish as indicated in Sections 13, 14 and 15.

Inspection

20. The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the material is being furnished in accordance with these specifications except when an agreement has previously been made between the manufacturer and purchaser regarding the cost of such tests. All tests (except check analyses) and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

Rejection

21. *(a)* Unless otherwise specified, any rejection based on tests in accordance with these specifications shall be reported within 10 days from date of test.

(b) Material which shows injurious defects subsequent to its acceptance at the manufacturer's works shall be rejected and the manufacturer notified.

Table VI.—Dimensional Tolerances of Hot-Rolled Strip

THICKNESS TOLERANCES

Thickness	Width: 5 in. and Under	Over 5 to 10 in., incl.	Over 10 to 15 in., incl.	Over 15 to 23 1/16 in., incl.
No. 23 to No. 18, incl.	+0.003 in. —0.003 in.	+0.004 in. —0.004 in.	....	....
No. 17 to No. 11, incl.	+0.004 in. —0.004 in.	+0.005 in. —0.005 in.	+0.006 in. —0.006 in.	+0.007 in. —0.007 in.
No. 10 to 0.187 in., incl.	+0.005 in. —0.005 in.	+0.006 in. —0.006 in.	+0.007 in. —0.007 in.	+0.008 in. —0.008 in.
0.188 to 0.249 in., incl.	+0.006 in. —0.006 in.	+0.007 in. —0.007 in.	+0.008 in. —0.008 in.	+0.009 in. —0.009 in.

Thickness measurement shall be taken ¾ in. from edge of strip.
Tolerance for thickness at center measurement shall be that for the edge measurement plus:
0.001 in. for widths ½ to 1½ in.—0.002 in. for widths 1½ to 2½ in.—0.003 in. for widths 2½ to 5 in.
0.004 in. for widths 5 to 10 in.—0.005 in. for widths 10 to 15 in.—0.006 in. for widths 15 to 23 1/16 in.

WIDTH TOLERANCES	Plus	Minus
Up to 1 in. by No. 16 B.w.g. and heavier	1/32	1/32
Up to 1 in. by No. 17 B.w.g. and lighter	1/32	1/32
Over 1 to 2, incl	1/32	1/32
Over 2 to 5, incl	1/16	1/16
Over 5 to 10, incl	1/16	1/16
Over 10 to 15, incl	3/32	3/32
Over 15 to 20, incl	1/8	1/8
Over 20 to 23 1/16, incl	3/32	3/32

LENGTH TOLERANCES

Length of Strip, ft.	Up to 3 in. in Width: Plus	Minus	Over 3 Up to 6 in. in Width: Plus	Minus	Over 6 in. in Width: Plus	Minus
Up to 5, incl.	1/4 in.	0	1/4 in.	0	1/4 in.	0
Over 5 to 10, incl.	3/8 in.	0	3/8 in.	0	3/8 in.	0
Over 10 to 20, incl.	1/2 in.	0	1/2 in.	0	1 in.	0
Over 20 to 30, incl.	3/4 in.	0	3/4 in.	0	1 1/4 in.	0
Over 30 to 40, incl.	1 in.	0	1 in.	0	1 1/2 in.	0
Over 40	1 1/4 in.	0	1 1/4 in.	0	1 1/2 in.	0

CAMBER TOLERANCE

Strip shall be as straight as practicable and not more than ¼ in. out of line in any 8 ft. of length, with camber measurement taken on the concave edge.

Table VII.—Standard Rolling Tolerances of Plates

THICKNESS TOLERANCES[a]

All plates must be ordered to thickness and not to weight per square foot. No plates shall vary more than 0.01 in. under the thickness ordered, and the overweight of each lot[b] in each shipment shall not exceed the amount given in the table below.

WEIGHT TOLERANCES[c]

Ordered thickness, in.	Permissible Excess in Average Weight per Square Foot of Plates for Widths Given, Expressed in Percentage of Nominal Weight: Under 48 in.	48 in., incl., to 60 in., excl.	60 in., incl., to 72 in., excl.	72 in., incl., to 84 in., excl.	84 in., incl., to 96 in., excl.	96 in., incl. to 108 in., excl.	108 in., incl., to 120 in., excl.	120 in., incl., to 132 in., excl.	132 in., incl., to 144 in., excl.
5/16, incl., to 1/4, excl.	10.5	12	13.5	15	18	....	....	....	....
1/4, incl., to 5/16, excl.	9	10.5	12	13.5	15	18	21	24	28.5
5/16, incl., to 3/8, excl.	7.5	9	10.5	12	13.5	15	18	21	25.5
3/8, incl., to 5/16, excl.	7	7.5	9	10.5	12	13.5	15	18	22.5
5/16, incl., to 1/2, excl.	6	7	7.5	9	10.5	12	13.5	15	19.5
1/2, incl., to 5/8, excl.	5.5	6	7	7.5	9	10.5	12	13.5	16.5
5/8, incl., to 3/4, excl.	4.5	5.5	6	7	7.5	9	10.5	12	13.5
3/4, incl., to 1, excl.	4	4.5	5.5	6	7	7.5	9	10.5	12
1, or over	4	4	4.5	5.5	6	7	7.5	9	10.5

[a] Spot grinding is permitted to remove surface imperfections not to exceed 0.01 in. under the specified thickness.
[b] The term "lot" means all of the plates of each group width and each group thickness.
[c] The weight of individual plates shall not exceed the nominal weight by more than one and one-third times the amount given in the above table.

The Round Table

GOING TO TOWNSEND

"Greetings," said Ed, as he entered Al's little shop, "I suppose you'll be spending a lot of money during 1936."

"Probably more than last year, Ed, because I'm making more; but as usual I expect to salt a little away for my old age."

"You don't have to worry about that any longer, Al. Dr. Townsend tells us that if we adopt his plan everyone over 60 will get $200 a month. And the way some candidates for Congress are indorsing the program, it looks as though he has a good chance of putting it across. Seems to be a sure-fire vote getter."

"Perhaps anything is fair in politics, Ed, but I'm surprised to see a man with your professed intelligence fall for such a wild-eyed scheme. You're not serious are you?"

"Sure; or at least I've got an open mind on the question. A lot of people like you say it can't be done, but nobody has explained why. Townsend claims that a two per cent sales tax will cover the expense, and that doesn't seem too much to pay for old age security."

"You mean two per cent on every business transaction, Ed."

"Even so, it should be worth the cost. We'd take some of the old timers off relief and restore their self respect by providing for them properly. Others could retire, make room for younger men and so absorb the unemployed. Another part of the plan is to require every pensioner to spend the entire $200 each month. What a boost that will give business. Is there anything wrong with that?"

"Just simple arithmetic, Ed. The total national income in 1934 was about $49,000,000,000. Under the Townsend Plan about 10,000,000 persons over 60 could quality for a pension, which means a yearly outlay for that purpose alone of $2,400 each or $24,000,000,000. The average income of those who received income in this country last year was $980. Nearly half of this would go to a selected group that is unproductive."

"Wait a minute, Al. This tax wouldn't hit everyone alike. You've got your own business, so you'd have a lot of taxes to pay on your materials and equipment, and on what you sold. But I'm only a foreman, and all I'd pay is two per cent on retail purchases."

"You'd find out soon enough, Ed, that you'd pay plenty, although it wouldn't all be called taxes. For one thing a car that you can get now for $600 would cost over $1,000; the price of everything else you bought would be stepped up 50 to 100 per cent."

"And why should that be?"

"Well, stick to the car as an example; try to imagine every business transaction that goes into it, right from the field and the mine. Include everything —the steel with its alloys of nickel and chromium, the glass, fabric, rubber and all the other materials that make up a modern car. At every step each part

would pay its two per cent toll; by the time you bought it all the taxes would pyramid into a good sized dent in your pocketbook. You simply can't collect half the national income for one group without injuring the purchasing power of everyone else."

"You certainly take the joy out of life, Al. I was looking forward to the day when I'd have a good income without saving or worrying about it."

"You've got plenty of company, Ed, and that's one of the worst parts of this scheme. It raises false hopes for an absolutely impossible plan. It kills all idea of thrift and self-reliance which were once ranked as sterling virtues."

"But what can we do for the old-timers, Al?"

"We're doing something for them under the Security Act, Ed. If the states match federal allotments destitute persons over 65 will receive $30 a month. That's not $200, it's true, but it figures out better mathematically. We should start with something that's practical, at least. Then we'll have a chance of success without crippling business, throwing workers out of jobs, reducing purchasing power and defeating the very ends we're trying to reach."

Would the Townsend Plan work? Or is Al right in contending that its enactment would be destructive to prosperity. Is the Security Bill as "practical" as Al says?

Home Talent

Heat-treatment certainly is a specialty. I have in mind a modern shop in which hardening of parts is an important issue. With a specialist on the job and with the finest equipment, this matter of hardening turns out to be a nightmare every so often.

It is a heartbreaking experience to carry on a rush job and to just about hit the line only to lose the part in hardening. The worst of it is that hardening is the last operation which makes it still more important.

The small shop as a rule cannot afford the best equipment, and unless there is enough hardening to be done to pay a man to do hardening exclusively and keep a dependable record of results, it will not be satisfactory. One might as well divide a man's time between a screw machine and the biggest planer in the house. It can be done, but it does not pay.

That's why so much agony and expense can be avoided by letting a reliable firm do the hardening for you.

—J. C. P. Bode.

Concrete Floors

Everybody's experience with concrete floors is about the same; namely, that they are uncomfortable to stand on for a long time. The reason is not so important, although we all know that the fact that concrete is a better conductor of heat than wood has a great deal to do with it. But not enough shops in this country are heated through concrete floors to know that it is an improvement.

However, there is one phase of the concrete floor that has not entered into this discussion, but is quite important. In a shop where the work is of a nature where sharp corners and fine finish are important factors, the accidental dropping of a piece of work might mean its ruination, or the loss of many hours in doctoring it; something that will seldom happen to a piece dropped on a wooden floor.

—Edward Heller.

A New Line

Taking up a new line of manufacture calls for careful consideration. The first question is, can the article be made at a profit and sold at a competitive price? It must be remembered that there are many established makes of farm engines now on the market. Inventors' ideas are not always practicable and the man in the shop has usually to overcome constructional difficulties which the inventor has overlooked. This takes both time and money and may cause a loss in the first year's business.

Another question is, if the invention is really a good one, why was it not submitted to a concern already making such articles, who might take it up if it had any practical advantages? Concerns manufacturing farm engines have their experts, are in close touch with customers' requirements and have knowledge that has taken years to acquire.

While it is certainly an advantage to have more than one line of manufacture, a new line can be started with any hope of success only when there is ample financial backing and a reasonably assured market for the article produced.

—W. E. Warner,
Bromley Common, Kent, England.

Purchased Parts

Was there ever a small shop located near other small shops that did not farm out some of its work? Why buy an expensive machine when one just like it is in the shop around the corner, unless there is work enough to keep it busy? Or why turn down an order merely because of lack of equipment to finish some of the parts, when they can be finished by a neighboring shop?

With most small shops there is no question about the advisability of having part of the work done outside. It is a necessity. The only question is how much should be sent out, or how much work is necessary before purchasing new equipment. That is a question that involves so many features that it is impractical to discuss it as a general proposition. Each case must be considered on its merits.

—A. W. Forbes,
Forbes & Myers.

Al is quite right in farming out some of his work instead of increasing the size of his plant. Depreciation of equipment and buildings is a very serious matter, but there will be no trouble from that source in the work farmed out.

If Al does no work on the purchased parts there will be neither labor nor overhead charges against them. They will not have to bear depreciation charges if new buildings are not put up and additional equipment is not installed. Al will have the benefit of having his parts made in an up-to-date shop without the dread thought of what he will do if a slump comes.

Buying parts from outside concerns has much to commend it, provided the buyer employs a good inspector to watch the parts during manufacture. The resultant assembly will probably cost less than if all the parts were made in the home shop, as the parts made outside will have been mass produced. The consequent saving on purchased parts will probably more than pay for a good inspector who will insure that the parts are up to standard.

—D. Maclaren Cathcart,
Erdington, Birmingham, England.

Praise in Public

Considerate treatment of his workmen by a foreman is one of the surest ways to gain the respect, not only of his men, but of his superiors as well. The average workman will go the limit for a foreman who is generous with his praise when good work has been done. On the other hand, some very serious labor troubles have been directly traced to poor handling of his men by an inconsiderate foreman.

Ed's idea of criticizing a man and pointing out his mistakes in the presence of his fellow workmen is very embarrassing and is not conducive to harmony. It tends to make the man unsure of himself, as well as creating an ever-present fear of being reprimanded by his foreman on the slightest pretense.

—Robert Knotek,
Toolroom Foreman, Fisher Body Corporation, Cleveland Division.

Yearly Wage

Al has a real constructive idea on planning to try the yearly wage. To make it work to the mutual satisfaction of all concerned there should be a predetermined and agreed upon minimum weekly pay for each class of workers. The plan should provide for a distribution of pay above the minimum at the end of each month or quarter, using the monthly balance, or operating, sheet for the former and the quarterly earnings sheet for the latter. At the end of the fiscal year there would be a final settlement.

To make the plan work and to secure the best possible dividends, it would be necessary to make a fairly accurate demand forecast. To keep the workers sold on the plan, any mistakes made by the forecasters in their first attempt that would adversely affect the workers' pay would have to be rectified by the management.

I believe that in the general run of industrial plants, the yearly wage would be one of the best methods of giving capital and labor a common meeting point, resulting in gains to both.

—E. E. Gagnon.

IF THE WORKER ONLY KNEW—

Would he like the Labor Law?

BIG BILL and Sam, planer hands, are taking on a little energy in the form of Swiss on rye, with a glass of dark. They are also relaxing between the evening whistle and overtime.

"Just what is this Labor Relations Act, Bill? Is that the same thing the papers called the Labor Disputes Act and the Wagner Bill? And what does it do, anyway?"

"All the same thing, Sam. One rose with three names. Or maybe I oughtn't to call it a rose. Don't think it's as sweet as all that."

"You mean it ain't so good for us workers? I heard that union fellow the other night—he said it was going to fix everything up for us, that now we'll be able to get what's coming to us, because the law's back of us."

"Yes, I know how they talk. But we have to take those things with a grain of salt. You asked me what it does. I'll tell you and then you can see how you feel about it. First thing it does is to set up a lot of unfair labor practices."

"Things it's unfair for us to do?"

"No, things it's unfair for your boss to do. For example, he musn't interfere with workers' forming or joining labor organizations, or bargaining collectively. Then he isn't permitted to contribute help to a labor organization. And he isn't supposed to hire or fire a fellow because of his labor affiliations."

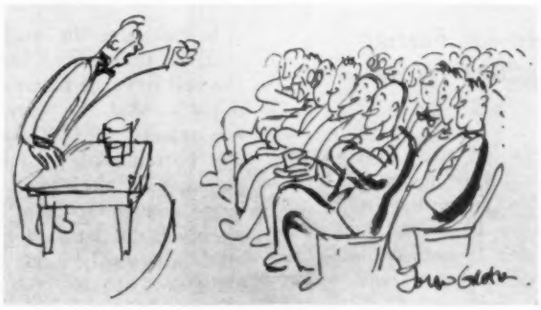
"But those things don't seem so bad, Bill. That all?"

"No, not all. According to the law our boss may agree that anyone must belong to a particular labor organization if he's going to work here, provided that organization represents over 50 per cent of our employees."

"That doesn't mean that we have to belong to a union, does it, and pay dues, and go on strike?"

"It means that we *might* have to belong to a union. And if we did, of course we'd have to pay dues. And we might have to go on strike—be mighty uncomfortable for us if the boys called a strike and we didn't go out."

"And I suppose that means we might have to go on a sympathy strike, because workers in some other plant and their boss couldn't get along together?"



I heard that union fellow the other night—he said it was going to fix everything up for us

"Sure. And if we didn't go out, we might have some of those flying squadrons around—and some broken heads."

"Well, suppose our company had a Works Council, Bill. Would we have to belong?"

"Yes, if over 50 per cent of the employees belonged, and the boss agreed that everybody had to."

"And would we be any better off?"

"I think so, Sam. I imagine we could settle our troubles without a strike. But if we couldn't, it would be our own private strike. There wouldn't be any outsider calling it."

"How do we know who represents us? 'Course I see that if we tried to have a Works Council we'd get everybody to vote. Would the union work that way, too?"

"No, not at first. They'd get their fellows into the plant and try to get us to join. Then when they thought they had enough, or could make an impression, they'd claim they represented the force and probably make demands on the boss. If he refused, chances are they'd ask the Labor Board to hold an election."

"Then could the Labor Board issue orders?"

"Oh, yes. And the whole situation could get into the courts."

"Looks like a mess, Bill. But I suppose it would be worth while if we workers got higher wages out of it."

"I doubt even that, Sam. You 'know you can't get blood out of a turnip.' The plants we work in can't pay out enough to keep them in the red all the time—and the more expenses they pass on to the consumers in higher prices the less business they'll have. So we might all lose out in the long run. And another thing. The more we're organized the closer we all come to getting the same wages. Believe me, I know I'm worth a lot more than some of the fellows we work with. I don't want to go down to their rate and I don't want them brought up to mine until they can do as much as I do."

"'Bout time to go back, Bill. One more question. You mentioned unfair labor practices for the boss. How about employees? Aren't flying squadrons, and threats, and other things we know about unfair?"

"The law doesn't say so, Sam. And they get away with 'em, don't they? For my part I don't want any. I've always managed to make pretty good money and I think I'll try hard to keep on doing my own bargaining. Let's go."

Reprints of this article, in pamphlet form, suitable for distribution in pay envelopes, can be secured at relatively small cost

Ideas FROM PRACTICAL MEN

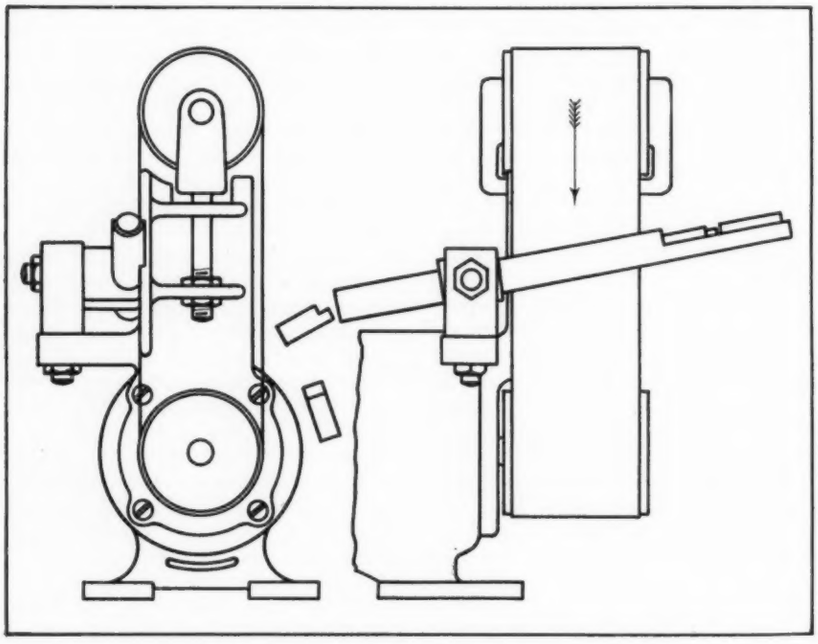
Fixture for Burring Cylindrical Work

OCTAVE ANTONIO

Where tolerances are close even small burrs cannot be ignored. It is often impossible or impracticable to remove burrs by hand and, when a centerless grinder is not available, a small belt polisher can easily be adapted to the purpose. These light, motorized machines are in the market and it remains only to apply the necessary attachments.

The machine is adjusted to bring the belt in the vertical position and adjustable brackets are provided to hold a tube crosswise of the belt, as illustrated. On the side toward the belt the tube is cut away to leave an opening the width of the belt. It is also cut away at the top of the right-hand end to facilitate loading the work. By means of the brackets, the tube is adjusted to cross the belt at a slight angle so that the work may be fed past the belt by gravity.

In practice, the angle of the tube and the pressure of the work against the belt must be balanced against each other so that the work will not spin too rapidly or that too much metal will be removed from it. The inside diameter of the tube should be just large enough so that the unburred work will not jam. A machine of this kind will easily take care of burrs 0.010 or 0.015 in. high and the work will be nicely polished as it leaves the tube. Where many thousands of parts are to be burred, this arrangement is particularly good because of the uniformity of finish and the rapidity of operation.



Burrs can be quickly removed from small parts by a belt polisher provided with an adjustable tube for feeding the work by gravity

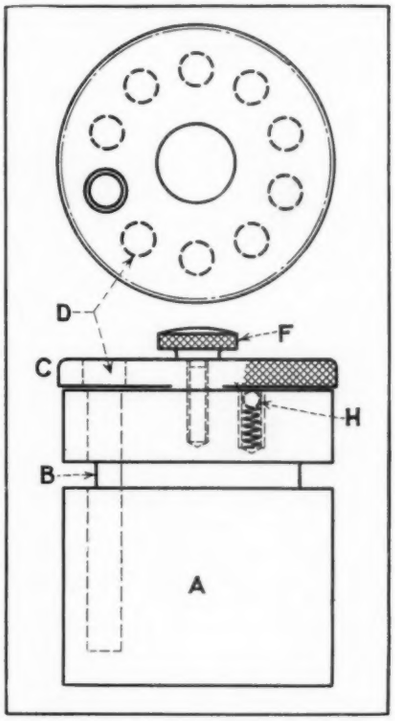
Container for Steel Stamps

WILLIAM M. HALLIDAY
Baildon, Yorkshire, England

Illustrated is an unspillable container for steel stamps. The body *A* can be made of either hardwood or aluminum. Ten equally spaced blind holes are drilled in a circle to hold the stamps, which are placed therein face upward. The groove *B* is cut just deep enough to break into the stamp holes and is used for sighting to see if all the stamps are in the container.

The aluminum cap *C* has an outlet hole at *D*, slightly larger but at the same radius as are the stamp holes. It also has a central hole for the clamp screw *F*. Dimples are drilled in the under side of the cap for the spring-actuated ball *H* to engage. Ten dimples are for the ball to engage when the outlet hole is in line with any of the stamp holes and the others when the outlet hole is between any two of the stamp holes.

In taking out a stamp, the clamp screw is loosened and the cap is turned until the desired stamp can be seen through the outlet hole and the ball engages one of the dimples. Then, when the container is tilted beyond the horizontal, the stamp will slide out. After the stamp has been returned to the container, the cap is turned until the outlet hole is between any of the stamp holes and the ball engages one of the dimples. The clamp screw is then tightened. With the cap locked in this position, the stamps cannot fall out should the container be turned upside down. The owner can tell at a glance whether all stamps are in place.



A stamp can be taken out of the container only when the outlet hole in the cap is in line with the hole containing the selected stamp

Abrasive Marking

CHARLES WESLOW

A sample of what I did with a small emery wheel attached to a Midget Dumore Electric Grinder, no bigger than your fist, is shown herewith. If I can do it, so can others, if they have a little training in writing.

There are times when markings on steel parts that have been hardened have been overlooked, and then such an emery wheel comes in handy instead of the old-fashioned etching, or when an electric writer is not available.

The facsimile of my signature is proof that I did it all by myself—and that's something for an old timer.

Foot-Operated Air Pump

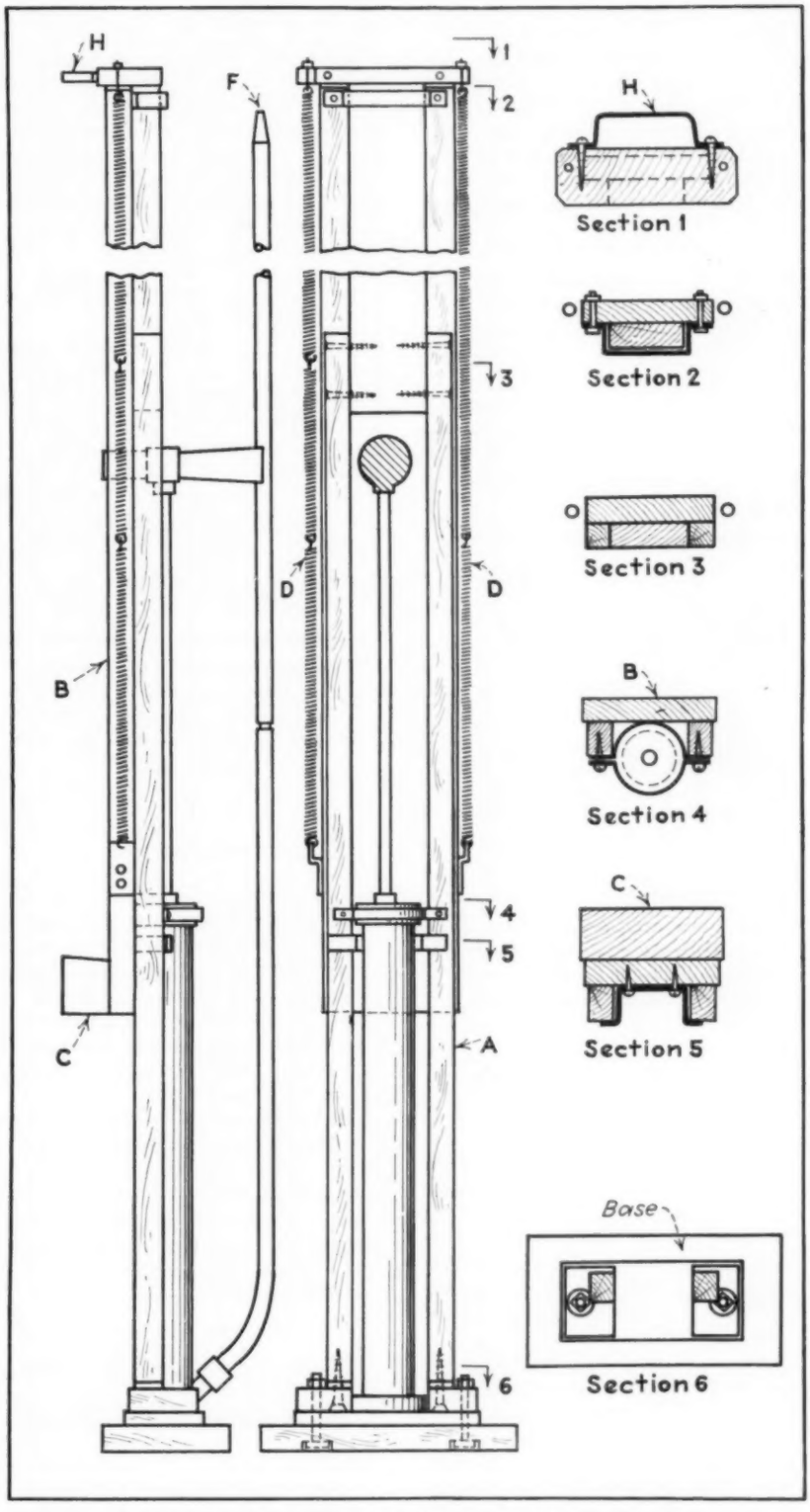
J. VAN H. WHIPPLE

A device by which an ordinary tire pump can be converted into a foot-operated pump suitable for blowing chips away is shown in the illustration.

Besides the tire pump, the device consists of the wooden frame *A;* the slide *B;* the pedal *C;* three helical springs *D;* an extra length of hose; the nozzle *F;* and the handle *H.*

The frame is about 56 in. high and its base rests on the floor, bringing the top a little below shoulder height. The slide is made of hardwood and the pedal is attached to its lower end. One end of the T-handle of the pump fits loosely in a hole at the mid-length of the slide. The springs are attached to the top of the frame and to the sides of the slide just above the pedal. Their function is to keep the pump piston at the top of the cylinder when there is no pressure on the pedal. The nozzle is a short piece of round brass drilled with a No. 56 drill. The small views at the right are sections at different parts of the device and will easily enable its construction to be understood.

In operation, the frame containing the pump is held vertically by the handle with one hand, the other hand holding the hose and directing the nozzle. A brisk downward push on the pedal with the foot gives a strong jet of air, lasting about five seconds. When pressure on the pedal is released, the springs quickly return the piston to the top of the cylinder, ready for another stroke. Five or six strokes are sufficient for the air jet to blow away a considerable accumulation of chips or dirt.



A foot-operated pump for blowing away chips or dirt from tools or work can easily be made from an ordinary tire pump

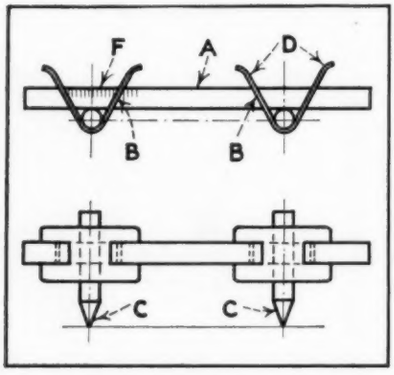
Improvised Beam Compass

JOHN A. HONEGGER

When a beam compass is wanted and none is at hand, the one illustrated can easily be made. It consists of the square beam *A;* two pieces of spring steel *B;* and the two points *C*. The beam can be made of either metal or hardwood. The pieces of spring steel have rectangular holes through which the beam passes, and are bent into V-shaped clips. When free they spring out sufficiently to hug the points tightly to the beam.

A slight pinching pressure on the ends *D* of the spring clips will free them sufficiently to permit them to be slid along the beam. The points are made of tool steel and are hardened and drawn.

If additional refinement is desired, a graduated scale can be attached to the beam as at *F*, but it should be let in so as to be flush with the surface of the beam.



This beam compass will serve its purpose in an emergency. It has but few parts and can be easily and cheaply made by any mechanic

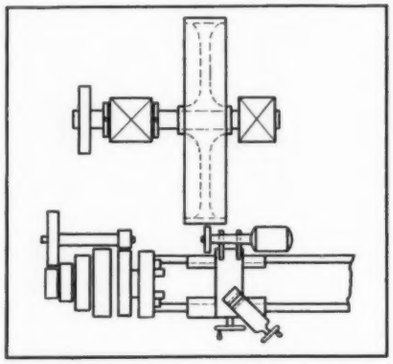
Grinding Bandsaw Wheels

H. M. JAMES
James Machine Works

We were recently called upon to true up the faces of a pair of bandsaw wheels having a diameter of 60 in. Since we had no lathe or other machine large enough to swing the wheels on centers, means had to be devised for doing the job, as our policy is never to turn down unusual jobs.

Two rigid stands were fabricated from angle iron to support the wheel shafts in their own bearings. The stands were lined up on the floor at the rear of an 18-in. lathe, the wheel shafts being parallel with the ways of the lathe in both directions. A pulley was placed on the projecting end of the wheel shaft and connected by a belt to the backgear quill of the lathe, as shown in the illustration. A bracket was fitted to the rear of the toolblock to support a portable grinder so that the face of the abrasive wheel would project beyond the back of the lathe bed.

With the backgears engaged, the lathe was run at a speed that would revolve the bandsaw wheel slowly. Grinding was done by traversing the carriage, the depth of cut being controlled by the cross feed. A surprisingly good job resulted, principally because the wheel shafts were revolved in their own bearings.



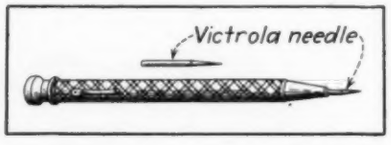
The wheel shafts ran in their own bearings and the wheels were slowly revolved by a belt connecting a pulley on the wheel shaft to the back-gear quill of the lathe

Handy Scriber

J. E. MOORE

An excellent pocket scriber can be made by inserting an extra-hard phonograph needle in an Eversharp or other propelling and retracting pencil in place of the lead. Such needles are very sharp and when one has become dull it can easily be removed and replaced by a sharp one.

The needle can be retracted so that the point is sheathed by operating the pencil in the usual way. The pencil can then be clipped to the pocket and carried without danger of the needle penetrating one's clothing or injuring one in any way. The illustration shows the scheme.



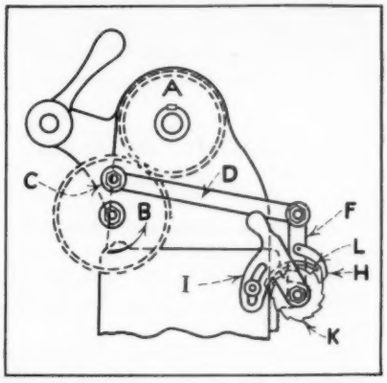
A phonograph needle inserted in an Eversharp pencil makes an excellent pocket scriber. It can be safely carried in the pocket

Intermittent Cross Feed

HERBERT M. DARLING
Superintendent, Wells Tool Company

In turning blanks for circular forming tools, they are usually roughed out with a single-point tool and the turning is finished to correct contour and diameter by a master tool. This final turning operation is slow and tedious, since, owing to the width of the master tool and the consequent width of the chip, constant feed is impossible. Due to these conditions it is necessary for the operator to feed the master tool intermittently, feeding at each revolution of the work.

At the suggestion of the operator, the intermittent feed device illustrated was made and attached to the lathe. It consists of the gear *A* keyed on the end of the lathe spindle; the gear *B* having the same number of teeth and meshing with gear *A*, and carrying the crankpin *C;* the connecting rod *D;* the pawl lever *F;* the pawl *H;* the feed



Intermittent cross feed is caused by the pawl engaging the ratchet attached to the feed rod. The depth of cut is controlled by the position of the feed regulator

regulator *I;* and the ratchet *K* keyed on the feed rod.

As the pawl lever is moved forward by the connecting rod, the pawl engages the ratchet teeth and turns the feed rod through part of a revolution, imparting intermittent motion to the tool block. The amount of feed is regulated by the position of the feed regulator. On the back stroke of the pawl, it rides up on the guard of the feed regulator at *L*. Although the movement of the pawl is always the same amount, it can engage from one to four teeth of the ratchet, according to the position of the feed regulator. This difference in feed permits a heavier cut to be taken on narrow forming tools, and a lighter cut on wider ones.

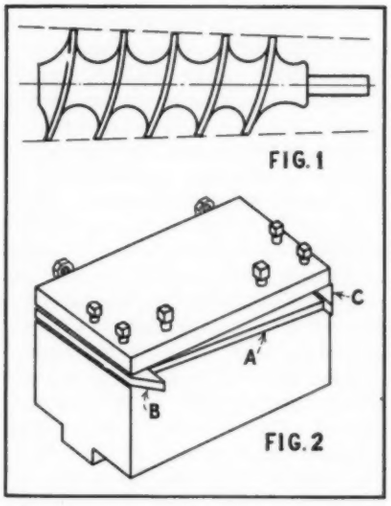
Using the Engine Lathe for Production

J. D. RELYEA
St. Mary's, Ontario, Canada

We had to machine some cast-iron worms, such as the one illustrated in Fig. 1, but the quantity lots were too small to justify the expense of special equipment. The outsides of the worms were to be turned to a slight taper and the ends were to be faced, the other parts being left rough. At first the work was done with ordinary lathe tools, the time being about 7 min. for each worm.

By using the simple toolblock shown in Fig. 2, the time was cut to 2½ min. The toolblock had a tongue to fit the upper part of the T-slot in the regular toolblock and was held in place by a bolt, not shown. The wide toolbit *A* was used to turn the outsides of the worms to the required taper and the toolbits *B* and *C* were used to face the ends, all in one plunge cut.

A further saving in time was made by providing an additional lathe dog. While one worm was being machined, the operator clamped the extra dog on the next worm to be operated upon.



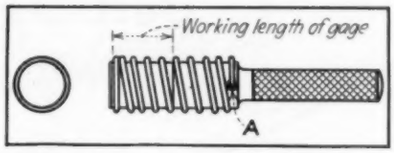
Turning the outside of a tapered cast-iron worm and facing the ends in one plunge cut was made easy by the use of this simple toolblock

Protecting a Soft Gage

H. MOORE
Hamilton, Ontario, Canada

A plug gage recently made in a small shop was finished to size in the lathe and left soft because the shop had no facilities for grinding.

After a few days' use the gage received accidental bumps and nicks that destroyed its accuracy. Another gage made to replace it was made longer in the body and the working surface was protected by a helical brass spring, as shown in the illustration. The front coil of the spring was bent square with the axis and the coil at the opposite end was bent to enter the hole *A* to secure the spring in place.



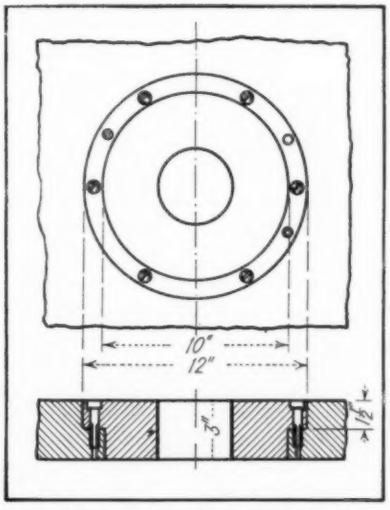
While the spring protects the gage from injury, it does not interfere with its use, as the coils are pushed closer together when the gage enters a hole

In use, when the gage is entered into the hole to be gaged, the spring is compressed, leaving the working part of the gage bare. As the gage is withdrawn from the hole, the spring is automatically extended to its full length, covering the working part of the gage and protecting it from injury.

Adapters for Bolsters

JOHN J. McHENRY

Even in the best managed press rooms, die-shoes will occasionally be broken. Many are the causes, some sound, some otherwise, but one contributing cause is the use of bolsters having openings that are too large to permit the die-shoes to be properly supported. For example, a die setter having several dies to change in limited time will knowingly take a chance by bolting a die on a bolster with a large opening.



The bolster is bored to suit the largest die and is provided with a series of interchangeable adapters to suit dies of different sizes

In order to have several different sizes of openings in our bolsters, they are bored to suit the largest dies and are provided with a series of interchangeable adapters having openings to suit dies of different sizes.

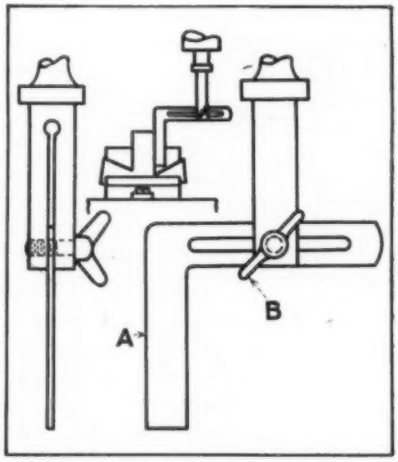
A bolster and one of the adapters are shown in the illustration. Since adopting this system, broken die-shoes are a thing of the past and the die setters are cooperating.

Gage for Setting Up Work on the Drill Press

FRANK MOORE
Hamilton, Ontario, Canada

Owing to obstructions on the work, it is sometimes impossible to use a square or a protractor in the usual way to set up a job held in the vise on the drill press. Again, the setting side of the work may be at an angle or the table or the tops of the vise jaws may be too much worn to provide an accurate surface for the square.

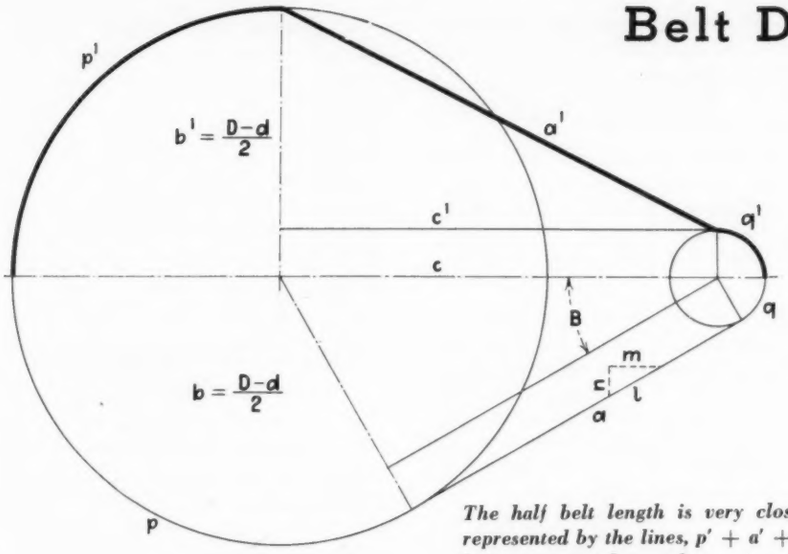
To overcome such difficulties the gage illustrated was made. It is intended to be used in one of the spindles



The shank of the gage is held in one of the spindles of a multi-spindle drill and the blade is set to either a square or a protractor, as may be required

of a multi-spindle drill press. The taper shank fits in the spindle and the body is slotted for the blade *A* and is drilled and tapped for the thumbscrew *B*. The blade is slotted so that it can be set by a square or at an angle by a protractor, as may be required. After the blade has been set and locked by the thumbscrew, the spindle is adjusted to the proper height and the work is brought into contact with the blade by sliding the vise on the table.

Belt Drive Calculation



The half belt length is very closely represented by the lines, $p' + a' + q'$ being very nearly equal to $p + a + q$

FRANCIS W. SHAW
Consulting Engineer
Whitworth, Lancashire, England

REFERRING to the article by B. Spector under the title given above (*AM*—Vol. 79, page 625), on checking the first example given, I find the error greater than would result from employing the far simpler method of scaling a drawing made by trial and error steps.

With pulley diameters of 30 in. and 9 in., respectively, and a belt length of 196.4 in., the method used by Mr. Spector has made the center distance 68 in. Calculating by a straightforward process, I find that the belt required for that center distance should be 199 in. long, a difference of not less than 2.6 inches.

By a simple approximate method now to be described, the center distance calculates out at 66.75 in., demanding a belt 196.42 in. long. One would certainly not worry about an error of 0.02 in. in a 16-ft. belt.

To illustrate the comparative accuracy of the new method, I have selected an extreme case in which the velocity ratio is 6, the pulleys having diameters of $D = 24$ in. and $d = 4$ in. respectively, the belt length being 89.1 in. It is required to find the center distance c in the accompanying diagram.

From the diagram it should be apparent that the arcs p' and q' are together equal to the circumference of a circle of $\frac{1}{4}(D + d)$ in diameter, the value of which can be found from a table of circumferences.

Let $p' + q' = S$, then
$$S = \tfrac{1}{4}(D + d) \times \pi \quad (1)$$

The inclined length a' is obviously equal to the half belt-length $(\frac{1}{2}L)$, less the two arcs p' and q'; that is,
$$a' = \tfrac{1}{2}L - S \quad (2)$$

Since in the right-angle triangle $a'b'c'$, b' is equal to half the difference of the pulley diameters, it follows that
$$b' = \tfrac{1}{2}(D - d) \quad (3)$$

The center distance can now be found by the familiar formula
$$c'^2 = a'^2 - b'^2 \quad (4)$$

For the given example, using these formulas in turn, we get

$S = \frac{1}{4}(24 + 4) \times \pi = 7 \times \pi = 21.99$, which we will call 22.
$a' = \frac{1}{2}(89.1) - 22 = 22.55$
$b' = \frac{1}{2}(24 - 4) = 10$
$c'^2 = 22.55^2 - 10^2 = 408.5^2$
$c' = 20.2$, the required center distance.

Readers will not censure me for having selected with a view to an ultimate demonstration of the accuracy of the method, a half belt-angle B of 30 deg., so making the center distance exactly 20 in. The half belt-length was then ascertained by the summation of the two arcs p and q and the inclined length a, which (to avoid trigonometry, is equal to the square root of the difference between the squares of 20 and 10. Careful working, which the reader can easily check, placed the half-belt length at 44.55 in., the full length therefore being 89.1 inches.

The incorrect center distance of 20.2 in., as will be seen by the small triangle lmn would demand in theory a belt longer approximately by $2m$ sec B, where m is the discrepancy in the center distance. Here the addition to the length would be $2 \times 0.2 \times 1.15 = 0.46$ in. One would scarcely worry about an error of less than one-half inch in an 8-ft. belt. And the error can be eliminated if a back check is made in the manner described, and then by multiplying half the difference between the two belt lengths so found by the cosine of the half belt-angle. But—is it worth while?

To Keep Signs and Blueprints Clean

ROGER C. DICKEY
International Paper Box Machine Company

Of course the very nature of the work of a machine shop results in dirt; dirty hands, walls and blueprints. While one cannot vouchsafe a remedy for dirty hands, one can offer a method for keeping signs and blueprints clean.

Secure from any ten-cent store a roll of transparent cellophane. When a sign or poster is tacked on the wall or bulletin board, cut a piece of cellophane the same size as the sign and tack the two together on the wall. The attractiveness of the sign will be enhanced by the sparkling transparent paper. Should the transparent cellophane become soiled in the course of time, it is an easy matter to wash off the dirt with a sponge, as most transparent papers are now waterproof.

I have noticed that blueprints going through the shop plant are frequently soiled to such an extent that the figures are often illegible. A way to overcome this is to cut a number of blocks of one-half inch soft wood about ½ in. larger all the way around than the blueprint. Thumb tack the print to the board and cut a piece of cellophane the size of the board and tack that to the board over the print. The blueprint can then go from workman to workman. It is not folded, marked, torn or soiled, and when the shop is through with the blueprint it can be filed away in the shop office or drafting room for future use.

Shop Equipment NEWS

U. S. "Multi-Miller" and Stock Reel

A "Multi-Miller," embodying features for high-speed, semi-automatic production of large runs as well as for special hand milling operations, has been built by the U. S. Tool Co., Ampere, N. J. The power table feed is cam-actuated, which provides any desired table speed or combination of speeds. A single disk cam is used for all table movements, and it is so designed as to permit quick removal of cams and makes them easy to lay out. The table operation is semi-automatic, and is controlled by interchangeable cams of the disk type. A hand lever starts the table movement.

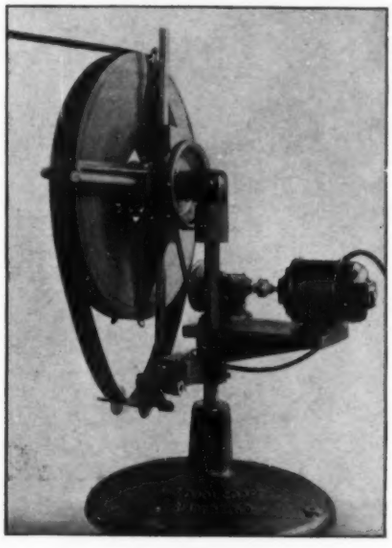
The cycle consists of a fast advance to cutting position; continued advance at pre-selected cutting feed; and fast return travel to loading position. Control of the changes of table feeds is obtained through a single cam, and the lever eliminates danger of jamming the work.

A lever controls the hand operation of the table, and when used thus, the machine has all the advantages of a hand miller with horizontal feed.

The table is 8½x22½ in., and the working surface is 6x20 in. One $\frac{5}{16}$ in. T-slot is provided in the center of the table. The longitudinal feed is 4 in. Feeds are governed by the throw of the feed cams, which are interchangeable. Table movement cycles of 10, 15, 20, 30, 45 and 60 seconds may be obtained by using single-, double- or triple-lobe cams. A 1/6 hp. motor drives the table feed. The anti-friction bearing mounted spindle is of heat-treated and ground steel, and the spindle end is fitted for No. 9 B&S taper arbor. The hole through the spindle is $\frac{17}{32}$ in. diameter. Horizontal adjustment of the spindle is 2¼ in., and is made by a nut graduated to 0.001 in. Vertical adjustment of the spindle totals 3¾ in., and is operated by a handwheel with a dial graduated to 0.001 in.

A ¼-hp. motor, not furnished, drives the spindle through V-belts, giving speeds of 177, 286, 850, and 1,290 r.p.m. Special pulleys will provide other speed ranges. Reversing the motor with a switch reverses the spindle. The arbor support is solid steel, and is rigidly clamped at two points. The cast column has thick walls, and the 10-gal. cutter coolant tank is cast in the base of the machine, and has a settling compartment. A coolant pump is provided.

U. S. "Multi-Miller," designed for either production work or hand milling operations. Below—Stock reel

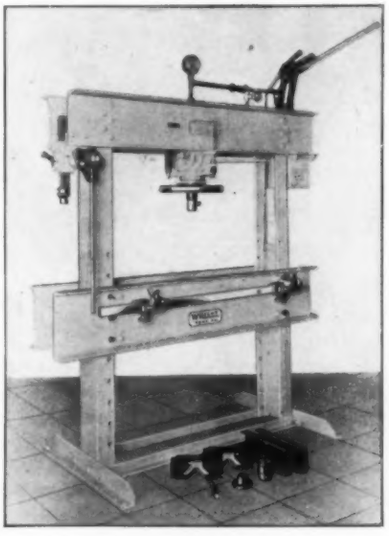


A motor-driven automatic stock reel has been developed by the U. S. Tool Co., Ampere, N. J., for heavily loaded reels of strip for stamping, forming or other operations requiring a steady, high-speed feed. The proper loop of stock is maintained by a mercury switch, which operates the motor. Two vertical types and a horizontal model are in the line. The capacities range from coils weighing 250 to 600 lb. Inclinable models may be had. The reel prevents whipping and strain on the stock, because it automatically maintains any predetermined loop of the material required.

Wright 60-Ton Hydraulic Press

A 60-ton hydraulic press with two pumps has been announced by the Wright Mfg. Division of the American Chain Co., Inc., York, Pa. The press is furnished with instantaneous release, and is designed with open sides for taking work of any length. The table is winch operated, and the machine has an independent arbor press. A pressure gage, always in view of the

Wright 60-ton hydraulic press with open sides for work of any length. Other sizes are available



operator, shows the actual tonnage being used. One of the pumps is for fast work at moderately heavy pressures, and the other is for extremely heavy pressures. The overall height is 7 ft., and the floor space required is 36 in. x 69¼ in.

The table channels are 12 in., and the width between the channels is 8 7/16 in. The width between the uprights is 45 in., and the table travel is 28 in. The total distance between the lowest position of the table and the collapsed screw and ram is 37 in. The shipping weight is 1,370 lb.

Similar design principles have been incorporated in the Wright 25- and 40-ton hydraulic presses, and the 25- and 35-ton screw presses, which comprise the company's new line.

Farrel-Birmingham 140-Ton Press

A self-contained 140-ton hydraulic press has been announced by the Farrel-Birmingham Co., Inc., Ansonia, Conn. Made especially for plastic and rubber molding operations, the press can be used for other work. It has two platens 60x30 in. Two 8-in. rams provide 150 lb. per sq.in. pressure over the platen area. The cylinders are integral with the bottom crosshead.

The top crosshead, which also serves as an oil reservoir, has a steel bedplate on top on which is mounted the variable-displacement pump with its motor. In a recess in the face of the top crosshead are mounted steam and hydraulic gages with indirect lighting.

Rolled-steel slabs serve as tension members between the top and bottom crossheads, instead of the conventional tierods. The slide slabs are machined to take corresponding lugs on the top and bottom crossheads and adjustment is made with adjustable tapered keys. Ventilated grids are placed between the top and bottom steam platens and the top and moving crossheads to lessen the heat transfer between the platens and crosshead.

Farrel-Birmingham 140-ton hydraulic press with all non-functioning component parts inclosed, but readily accessible

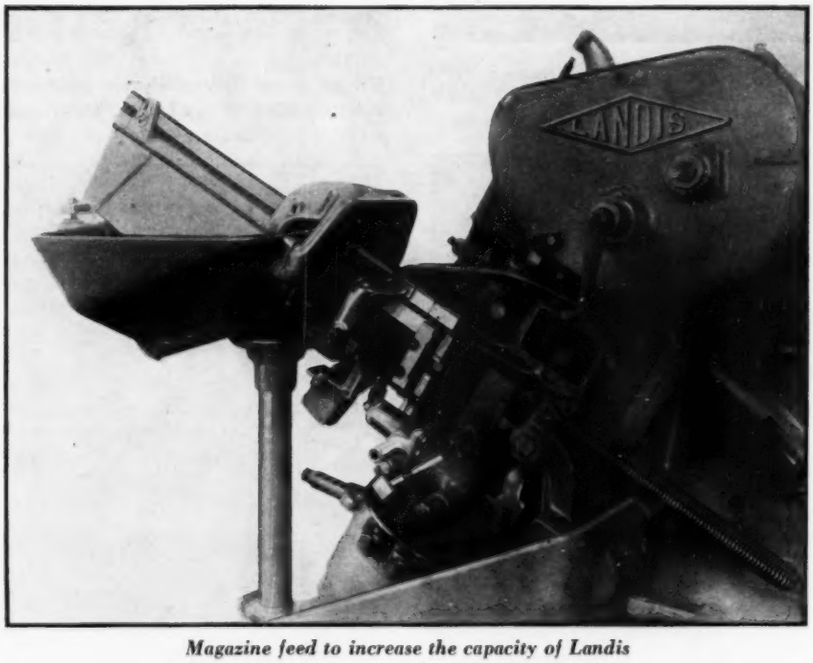
Only one valve is used to operate the press. Maximum pressure adjustment of the variable-displacement pump is made by the control handwheel on the pump, and is positively set.

"Aerisweld" Phosphor-Bronze Arc-Welding Electrode

"Aerisweld," a phosphor-bronze arc-welding electrode has been developed by the Lincoln Electric Co., 13010 Coit Rd., Cleveland, Ohio. It provides a solid, homogeneous deposit, with the characteristics of true phosphor bronze with high tensile strength. It is a shielded-arc electrode for use with the metallic arc. Its coating, as it burns, produces a gas which shields it from the atmosphere, and assists in easing the flow of melted metal in the arc.

The electrode is made in 5/32- and 1/8-in. sizes, 14 in. long, and comes packed in containers, 5 lb. net.

Magazine Feed for Landis Automatic Forming and Threading Machine



Magazine feed to increase the capacity of Landis automatic forming and threading machine

To increase the capacity of the Landis automatic forming and threading machine to take bolts longer than 6 in., a magazine feed has been designed by the Landis Machine Co., Waynesboro, Pa. The magazine will take bolts up to 7¼ in. long. The capacity range of the magazine is up to 2½ in. length of thread on 7/16 to ¾ or 1 in. diameter bolts from 2½ to 7¼ in. long; and with head thickness up to 1¼ in.

The magazine chute is 35 in. long from the loading end to the feeding end. By removing the hopper leaf, the magazine can be attached directly to the hopper, permitting the installation to be made while the machine is in service. The bolts must be placed in the hopper by hand. They are then automatically fed to the grippers, pointed, threaded and ejected. All factors remaining equal, i.e., diameter, pitch, thread length and cutting speed, production will be the same as the regular machine equipped with hopper leaf for fully automatic feeding.

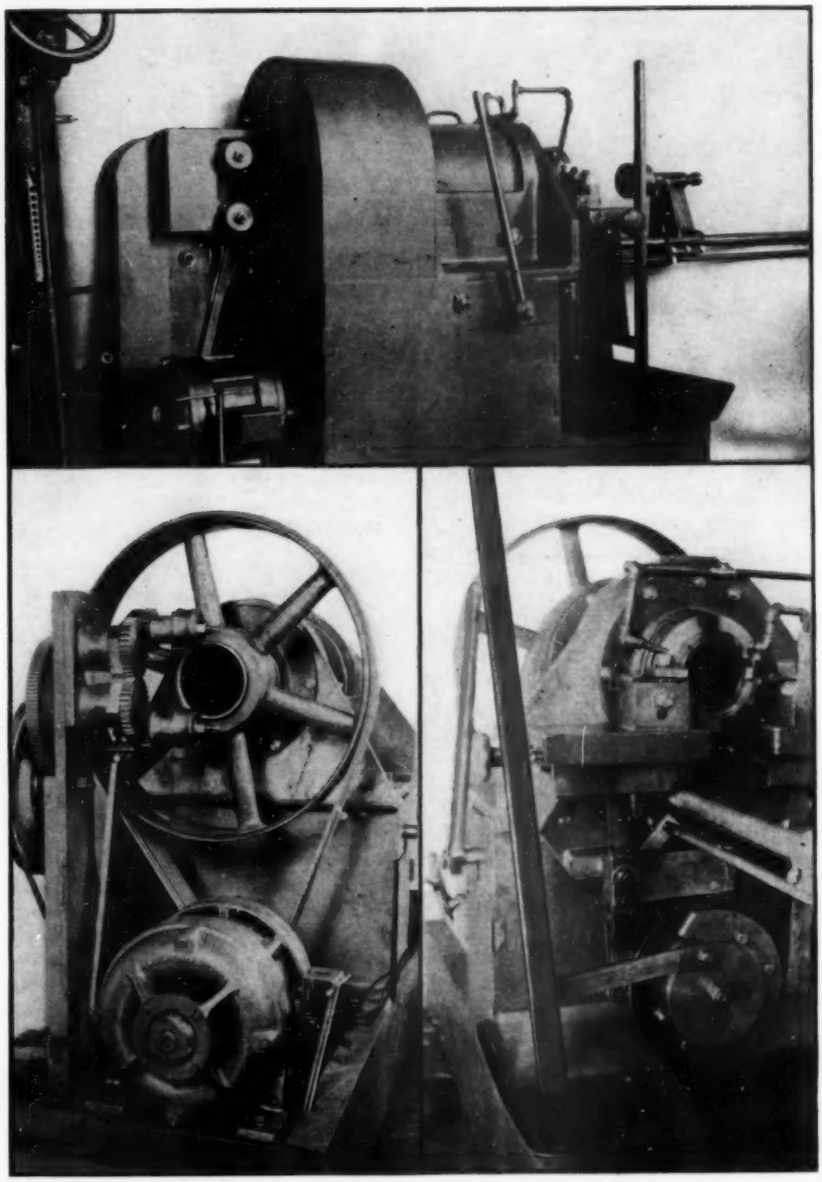
Modern 4½ In. Cutting-Off Machine

A 4½-in. cutting-off machine has been added to the line of the Modern Machine Tool Co., Jackson, Mich. Test runs made on 3½-in. steel tubing, with a ¼ in. wall, have shown speeds of less than six seconds over-all time. The spindle of the machine is carried on a large roller bearing. The cone and adjusting nut for operating the collet are placed between the bearings, back of which is the drive pulley.

The machine is equipped with a double, live-roller feed, operated from the collet control lever, for shoving the stock through the spindle. The in-movement of the collet control lever opens the collet and brings the feed rolls up to the stock. Because of its cam action, only a slight pressure is required to feed any length of stock through the machine until it strikes the stop. Reversing the lever throws the feed rolls clear of the work, and closes the collet.

The machine is equipped with double, cam-actuated tool-slides, each of which has an independent screw adjustment. Both the front and rear tools may be used for cutting off by using identical cams. By using a special cam on the back tool-slide any kind of chamfering or turning tool may be used and may be fed in at any predetermined position. A hand lever operates these cams.

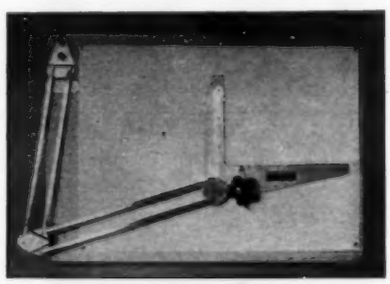
Two motors drive the machine. One, a 3- or 5-hp. motor with V-flat-belts, is mounted on a swinging bracket to allow the use of different sizes of pulleys. A ¾-hp. motor runs a standard cutting compound pump and operates the power feed. The base of the machine is of welded construction, and all moving parts are fully protected with suitable guards. With motors, it weighs 2,540 lb.



Top—Modern 4½-in. cutting-off machine, showing complete guarding of moving parts. Lower left—Power driven feed rolls will feed the stock through the collet at 60 f.p.m. Lower right—Tool-slides are cam controlled

"Wrigraph" Model E-272 Drafting Machine

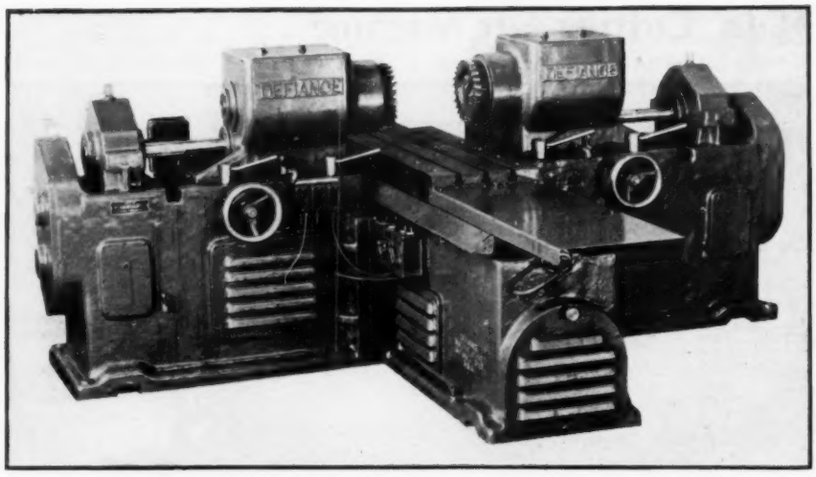
The "Wrigraph" Professional Model E-272, manufactured by L. G. Wright, Inc., 5714 Euclid Ave., Cleveland, Ohio, is mounted on a 22x30 in. cleated, white pine board. The parallel mechanism is hand-assembled with all-steel nickel-plated parts and phosphor-bronze bearings, and is calibrated for accuracy. It is equipped with a vernier indicating protractor reading in degrees. The protractor has a chuck plate to hold the drawing attachments in alignment. The L-square blade is made of pyroxylin and riveted to an aluminum stiffener.



"Wrigraph" Professional Model

Baldor 12-In. Bench or Pedstal Grinder

The Baldor Electric Co., 4351-63 Duncan Ave., St. Louis, Mo. has added a 12-in. bench and pedestal grinder to its line. Features of this machine are: heavy-duty motor of either 2 or 3 hp.; exhaust-type, hinged guards; adjustable toolrest which can be tilted for angle grinding; heavy wide-base pedestal. Standard equipment includes a water pot, tool trays and starter.



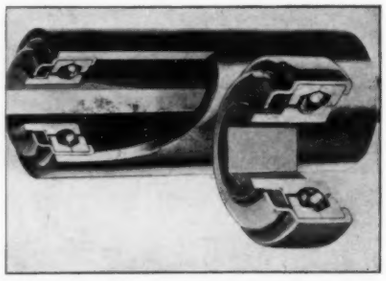
Defiance Horizontal Opposed Miller

A two-way opposed hydraulic-feed, face-milling machine has been built by the Defiance Machine Works, Defiance, Ohio, for simultaneously face milling opposite sides of castings. The base of the machine is a rigid cored casting. Dovetailed ways carry the table, and both ends have dovetailed ways on which the heads are mounted. The table has hydraulic feed, which provides an automatic cycle of fast advance, feed, and rapid return to stop. With additional dogs, the cycle can be arranged to provide a fast advance, feed, skip, feed and rapid return to stop. The table can feed in either direction by adjusting the dogs.

The work surface of the table is 18 in. wide and 36 in. long; the length of travel is 48 in. Control can be adjusted to give from 1½ to 40 in. feed per min., and the fast travel is 240 in. per min. Heads are fully inclosed, and have forced-feed lubrication. Cutterhead spindles are mounted in precision bearings, and have standard milling machine noses. Spindles and gears are of heat-treated alloy steel, and heads are arranged for V-belt drive. Reversing the motor revolves the spindles in the opposite direction.

Mathews Hexagon Type Conveyor Roller

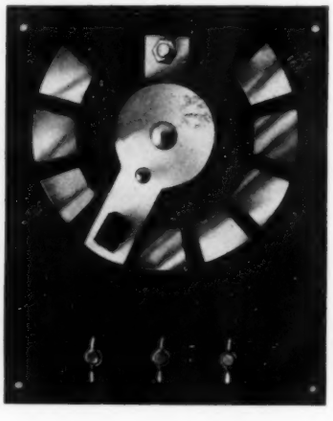
A new line of conveyor rollers, incorporating hexagon-shaped axles, has been announced by the Mathews Conveyor Co., Ellwood City, Pa. Seamless steel tubing, hardened steel bearing parts, solid steel outer and inner ball races are features of the construction of the rollers. Rollers in whatever lengths required are available in seventeen diameters, from 1 to 7⅝ in., with capacities ranging from 50 lb. continuous load rating for the 1 in. size to 8,000 lb. for the 7⅝ in. roller.



Mathews hexagon-type conveyor roller, cut away showing details of design preventing shaft rotation

Miller Switch Control for Arc Welders

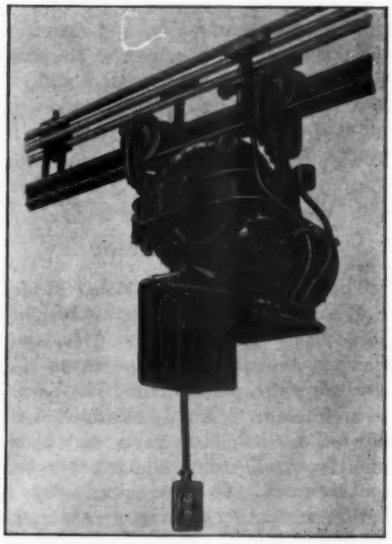
A simple dial switch control for arc welding equipment has been announced by Miller Electric Mfg. Co., Inc., Appleton, Wis., manufacturers of the "Miller Wonder" welders. The control has the amperage clearly marked on the switchboard, indicating each step in welding. When the dial is set at its proper figures, positive control of the amperage is assured. Its use stabilizes the arc and prevents sticking. The device is designed to prevent shorting of the electrical circuit between contacts. Because the operator must place the switch dial in the correct position before the welder can be used, safety to the operator is assured.



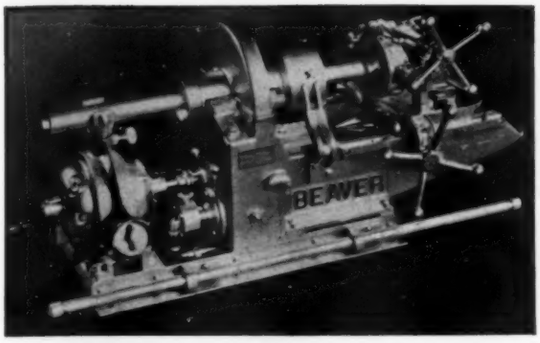
Pneumatic Tire Drive for Monorail Unit

A pneumatic rubber tire, pressing against the bottom of overhead rail of a monorail system, has been developed by the American MonoRail Co., 13107 Athens Ave., Cleveland, Ohio, to improve the control in monorail hoist operation. An electric motor, with reducer, drives the wheel on which is mounted the pneumatic tire. When inflated, the tire delivers many more foot-pounds of work than can be obtained with the same power with other type of traction.

Smooth operation of the tire-driven unit makes the use of multiple-operation cycles, controlled by relays, highly efficient. This is because cranes so equipped start easily as the traction is entirely independent of the load. Precise spotting is more easily done, even with heavy loads of bulky materials, because the trolley wheels carry the load only and have nothing to do with moving the crane or hoist. The high rubber-to-steel coefficient of friction materially reduces the power loss found in metal-to-metal traction.



A pneumatic rubber tire, pressed against the underside of a monorail, increases tractive efficiency of the hoist or crane



Left—Beaver pipe cutting, threading, chamfering, and reaming machine for ⅛ to 2 in. pipe. Will operate geared tools to cut and thread 2½ to 12 in. pipe

Beaver Model-A Pipe Machine

Model-A pipe machine to cut, thread, ream and chamfer all sizes of pipe from ⅛ to 2 in. has been developed by Beaver Pipe Tools, Inc., Warren, Ohio. It will operate geared tools to cut and thread 2½ to 12 in. pipe and will cut-off solid round bars or stayrods ¼ to 1 in., and thread bolts and stayrods from ¼ to 2 in.

A large star-wheel on the front of the machine feeds the machine manually. By swinging the cone-type reamer all trace of the burr is removed. The machine cuts steel, wrought iron, brass, copper or cast-iron pipe. The knives feed automatically, and have a safety guide ahead of the cutting edge to control the depth of cut, preventing "hogging in." The tilting workhead permits fittings to be made up in the machine by power. A heavy-duty universal motor provides ample power.

The rack and pinion is inverted to prevent chips from fouling the feed.

"Tabor-Brasive" Abrasive Cutting-Off Machine

"Tabor-Brasive" cut-off machine, a heavy-duty cutting-off unit, has been developed by the Tabor Mfg. Co., 6225 Tacony St., Philadelphia, Pa. The table is easily adjusted for height, and is made in two halves to accommodate odd shapes of work. The machine is fully guarded for the protection of the operator. It is driven by an air-cooled, inclosed motor which operates from a pushbutton switch. A multiple belt-drive is used.

The machine comes in four types, i.e., with stationary head, where the work is fed into the wheel by hand; with combination stationary and chopping head, for work requiring clamping; with traversing head, where the wheel is brought forward into the work; and with traveling table, where

"Tabor-Brasive" abrasive cut-off machine with split table

the work is clamped to the table for long cuts. The machine is suitable for cutting castings, bar stock, strip steel, tubing, structural shapes, tile, brick, refractories and similar materials.

Republic "Tower" Pneumatic Hose

A line of "Tower" oil-resisting pneumatic hose has been developed by the Republic Rubber Co., Youngstown, Ohio. A material similar to that used for oil-conducting hose has been used for the tube to combat high pressures, heat and oil under heavy service. Specially twisted cords are used for the closely braided plies, giving added strength without impairing flexibility. A tenacious rubber compound has been developed to impregnate the cord and to bond the plies to increase resistance to shock. The cover is made of a rubber compound which resists abrasions and cuts. There are six sizes, from ⅜ to 1½ in. The ⅜- and ½-in. sizes come in either 2- or 3-ply styles, and the larger hose is 3-ply.

Haskins Heavy-Duty No. 4 Tapper

The R. G. Haskins Co., 4630 West Fulton St., Chicago, Ill., has added the No. 4 heavy duty tapper to its line. This heavier model handles taps from ⅛ to ¾ in. in brass, and from ⅛ to ⅝ in. in steel, where the work consists of light-weight castings, forgings, stampings and screw-machine products.

The head is driven by a special 1-hp. motor, operating at 1,725 r.p.m., through pulleys providing three tap speeds of 550, 750 and 1,000 r.p.m. The reverse speed is double that of the tapping speed. The tap-head mechanism, which is removable, is entirely inclosed in a cast-alumium shell, sealing the gears, bearings and spindle shafts from dust and foreign matter.

The tap head is stationary and the work is brought to the tap by raising the table, which is operated by a rack and segment, through gears, by a forward pressure of the pedal. Two cushion springs absorb excessive or irregular pressure on the pedal, maintaining a constant feed. Positive lubrication is by rotary pump, the flow being controlled by a hand valve. The oil sump has a 3½-gal. capacity of tap lubricant. The tap spindle is designed for installing an acorn die and holder, instead of the collet chuck, to permit external threading.

Taylor "Thermospeed"

A separable well-tube system for temperature measurement and control has been developed by the Taylor Instrument Companies, Rochester, N. Y., to overcome the usual delay or lag in transmitting a change of temperature to the bulb. Laboratory and field tests indicate that the response due to the new construction closely approaches that of the companies' bare-bulb tube systems.

Dial or recording thermometers equipped with the "Thermospeed" system become more accurate in indicating every temperature variation, and assure closer regulation from controllers because the corrective action of the controller occurs at the slightest tendency of a departure from the control point.

Right — "Thermospeed" separable well-tube system overcomes usual lag in temperature measuring and control devices

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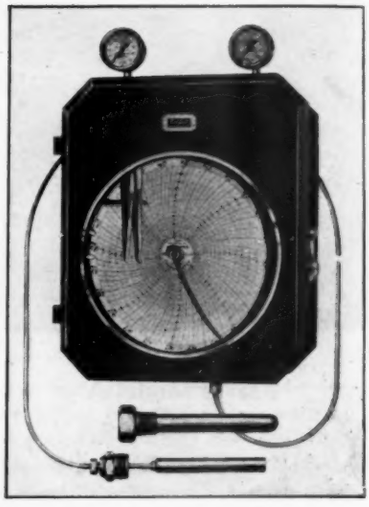

American Hydraulic 50-Ton Straightening Press

A 50-ton hydraulic straightening press, embodying the features of rapid advance, slow pressure stroke and rapid return, was recently built and sold to an automobile company by the American Broach & Machine Co., Ann Arbor, Mich. The press is powered with a 7½-hp. motor at 1,200 r.p.m. The two-stage pump is directly driven through a flexible coupling.

The table is 26 in. wide and has a depth of 18 in. Down stroke is at the rate of 104 in. per minute; the pressure stroke travels at 23 in. per minute and the up stroke is at 142 in. per minute. Diameter of the ram is 6 in., and the cylinder has a diameter of 11½ in. Weight of the press is approximately 11,000 lb.